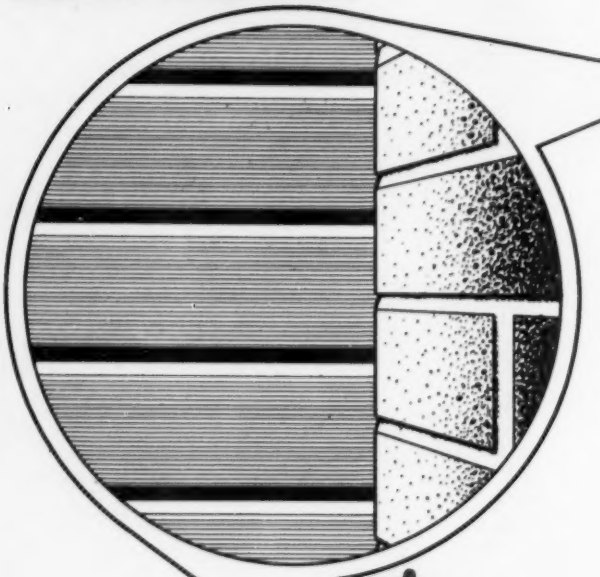
THE ARCHITECT & BUILDING NEWS

20 MAY 1954 · VOL. 205 · NO. 20 · ONE SHILLING WEEKLY

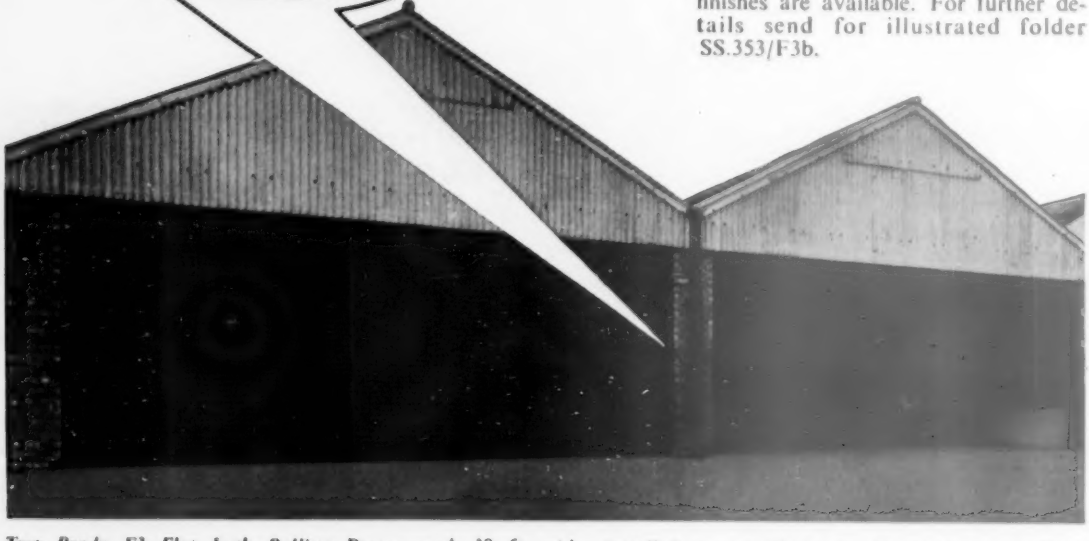
BRITISH ARCHITECTS CONFERENCE PREVIEW

BRADY SHUTTERS F 3 ROLLING DOORS



with the new flat laths for greater strength and better looks

Brady's new F3 rolling steel door is constructed of identical and interchangeable flat laths, which interlock throughout their length, and are more wind and weather tight. Rollers are of one diameter throughout their length and support the curtains through their full widths. Doors can be hand or electrically operated and standard finishes are available. For further details send for illustrated folder SS.353/F3b.



Two Brady F3 Flat Lath Rolling Doors, each 38 ft wide, installed on storesheds at Newcastle upon Tyne

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Telephone: COLlyhurst 2797/8

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BIRMINGHAM	Rectory Park Road, Sheldon, 26
CANADA	David C. Orrock & Co. (G. Brady & Co. Canada Ltd.) 1405 Bishop Street, Montreal 25, Que. and also at 23 Scott Street, Toronto, 1
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Uses increasing for New-type Mesh Metal

ADAPTABLE & ECONOMICAL

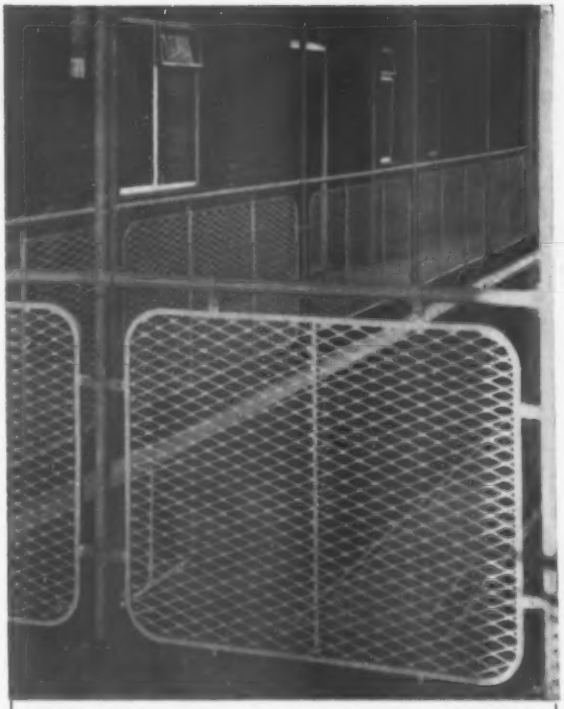
NEW uses for expanded metal are being discovered daily. The following are only a few of its many applications:— Safety guards for all kinds of machinery, radiators, trees, windows, ventilators, fires, etc. Racks and shelves, industrial trays and baskets, storage bins; air filters; backing for insulating materials; poultry cages; pallets and stillages; balcony balustrading; litter baskets; partitions and enclosures. Indeed, hundreds of widely different types of articles are now better and more easily made with Expanded Metal, now available in two new forms: Flattened "Expamet" and Safe-mesh "Expamet".

What is Expanded Metal?

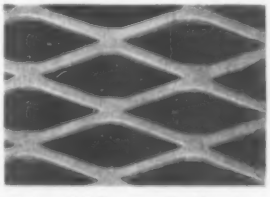
Expanded metal is made from a solid sheet of rolled sheet metal — steel, stainless steel, aluminium, brass or copper. It is cut and expanded without any waste of material into a network of diamond shaped meshes. The finished meshwork is strong and durable; it is easy to work, weld and shape; it has a naturally decorative appearance and is suitable for most of the available finishing processes.

Two New Types

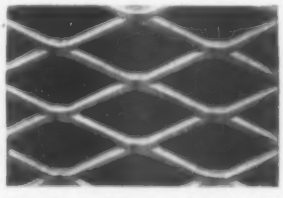
The two new basic ranges of expanded metal which are now on the market are — Flattened and Safe-mesh "Expamet". The first, Flattened "Expamet", is made by brushing and pressure-rolling the strands and junctions of Expanded Metal, so as to obtain a flat, smooth and level surface. The other, Safe-mesh "Expamet", is a range of meshes which has been brushed to remove all burrs and rough edges.



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Flattened "Expamet" *The above illustration shows an example of Flattened "Expamet". This is made in thirteen different weights and mesh sizes from 5/32" to 1½" (shortway of mesh).*



Safe-Mesh "Expamet" *Pictured above is Safe-Mesh "Expamet" which is produced in eight standard weights, and in mesh sizes from ¼" to 1½" (shortway of mesh).*



Staircase balustrading with **Flattened "Expamet"** *at Hall & Co. Ltd. premises, Folkestone.*

Can it Help You?

Adaptable, economical and long lasting — there are an infinite number of uses for Expanded Metal. Wherever there is a gap to be filled or an article to be made with open meshwork, industry is using this very versatile material; and imaginative executives are finding new and unsuspected uses for it daily. For full information and advice, please write or telephone.

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Stranton Works, West Hartlepool. *Telephone: Hartlepools 2194*
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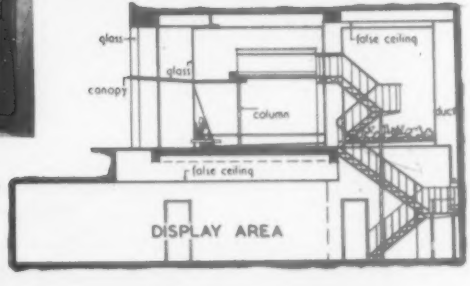
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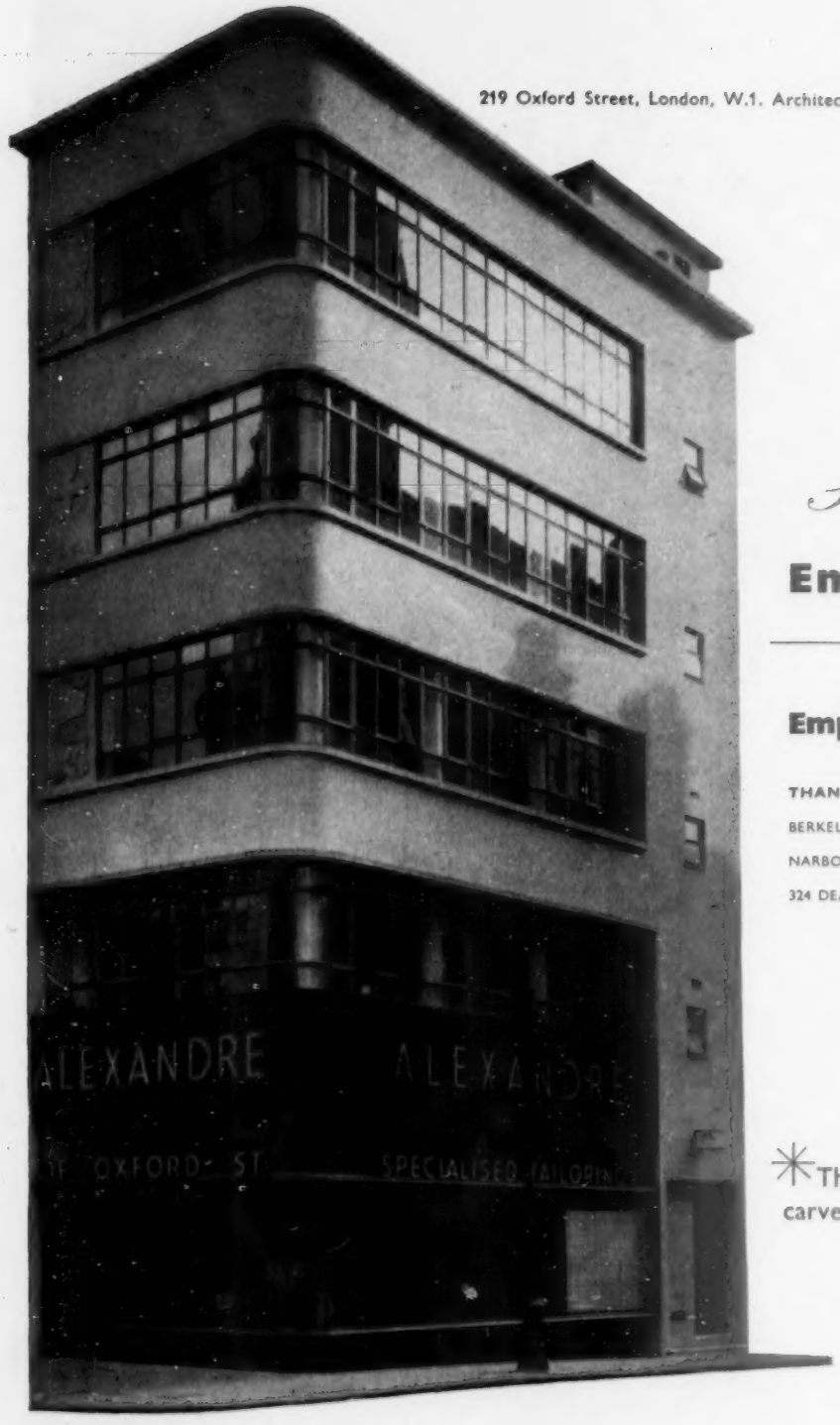


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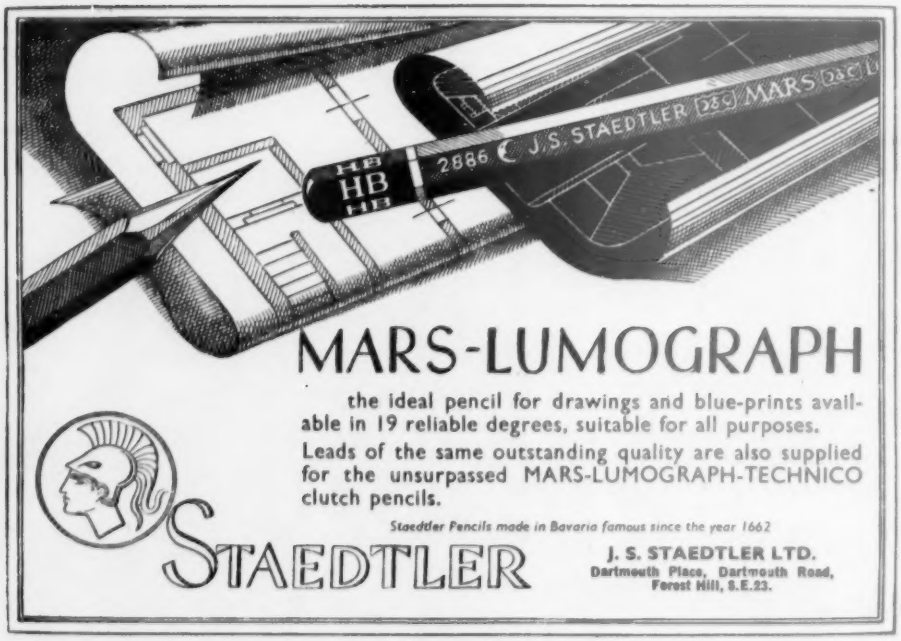


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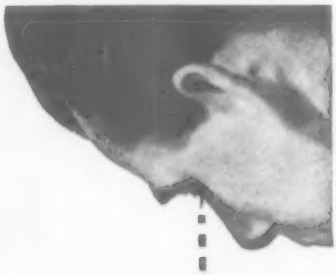
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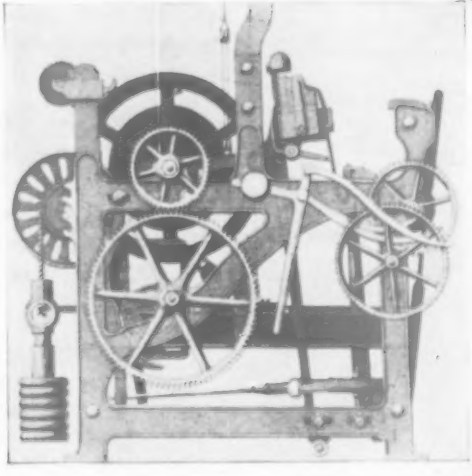
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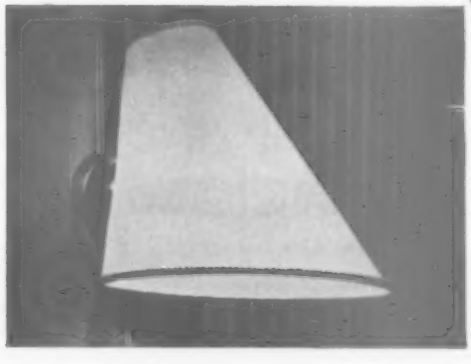
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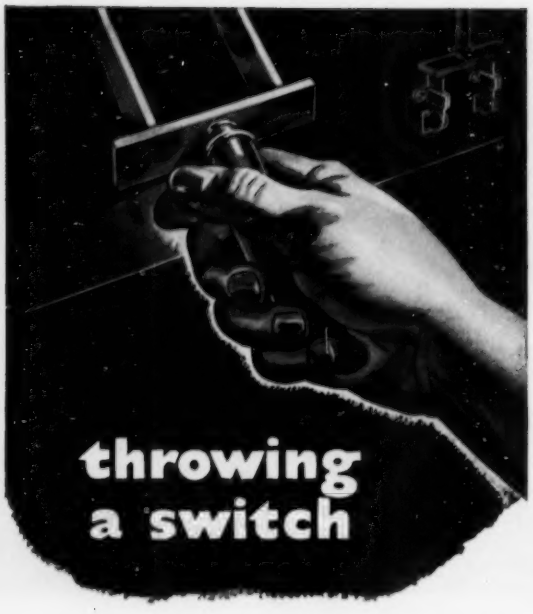
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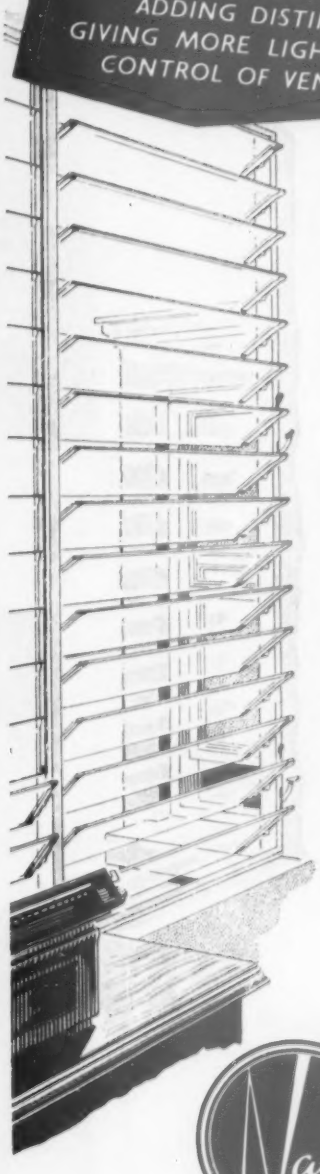
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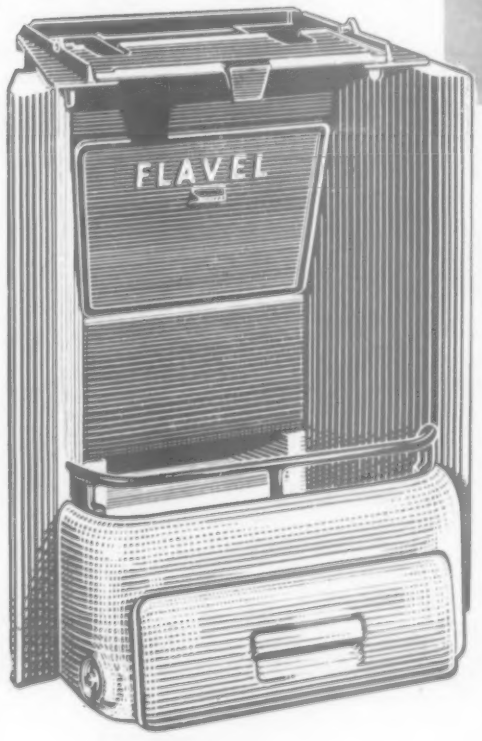
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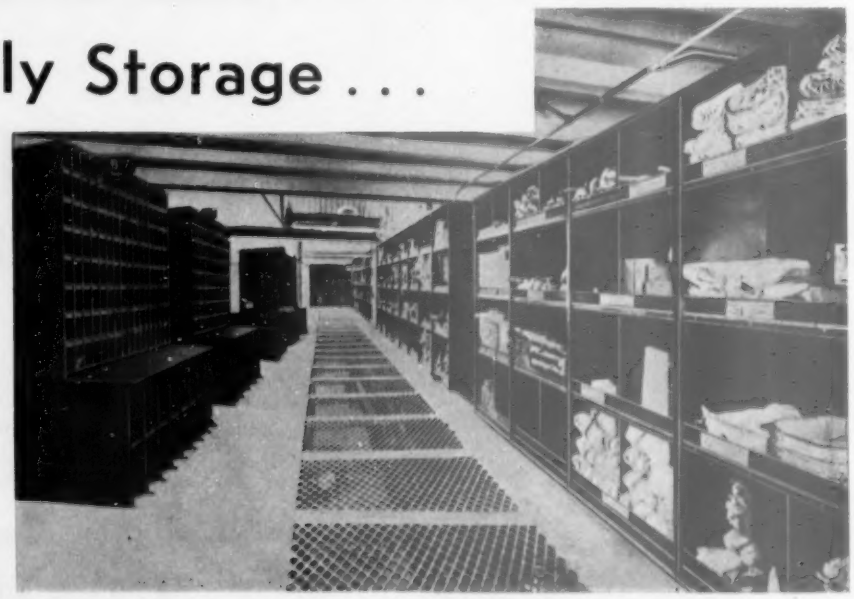
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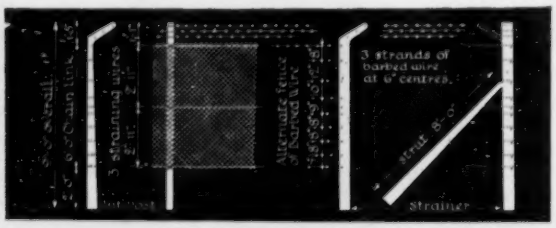
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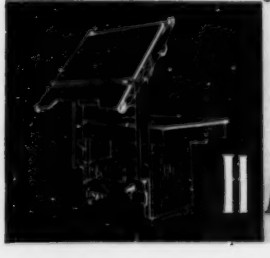




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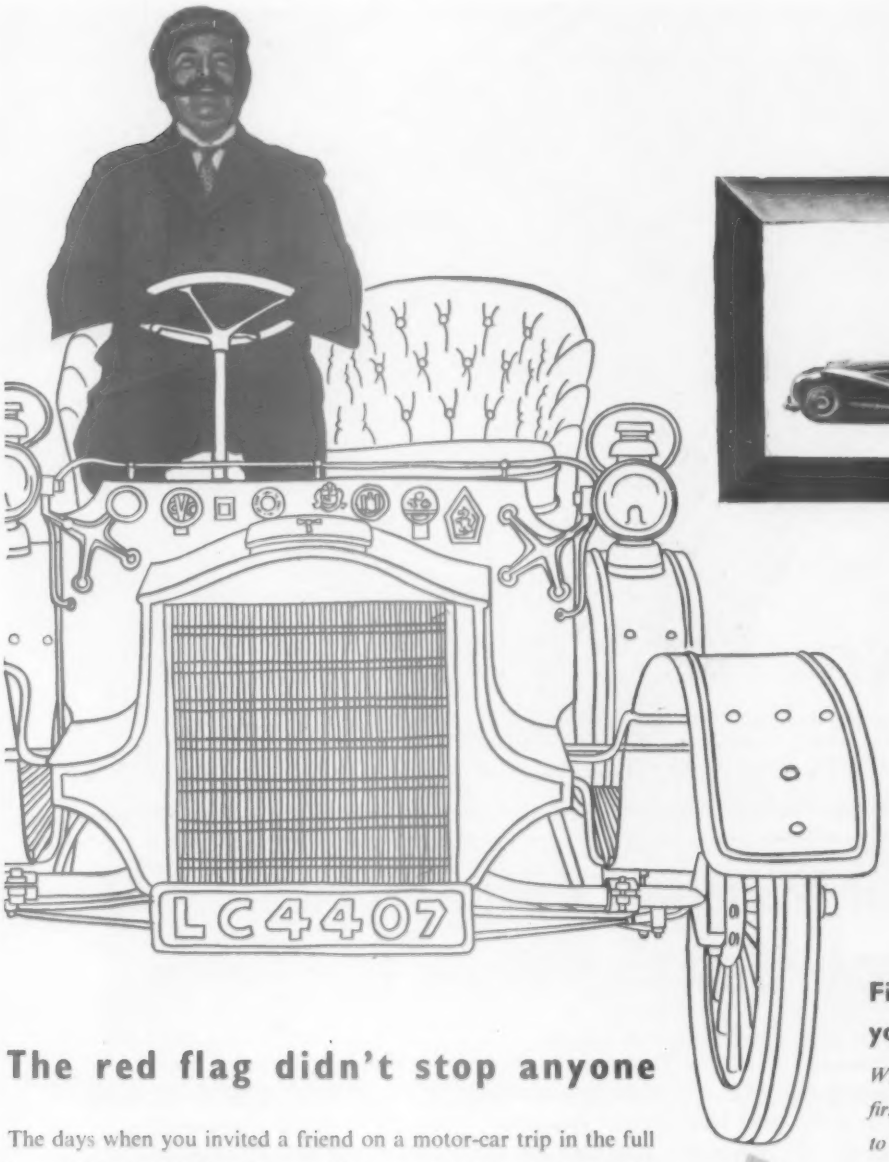


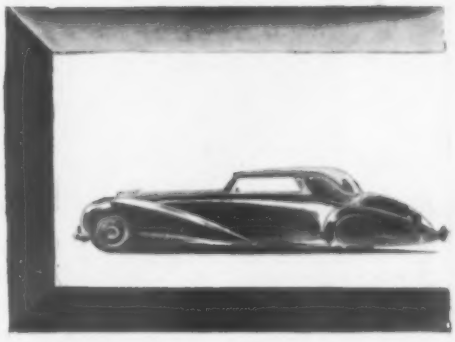
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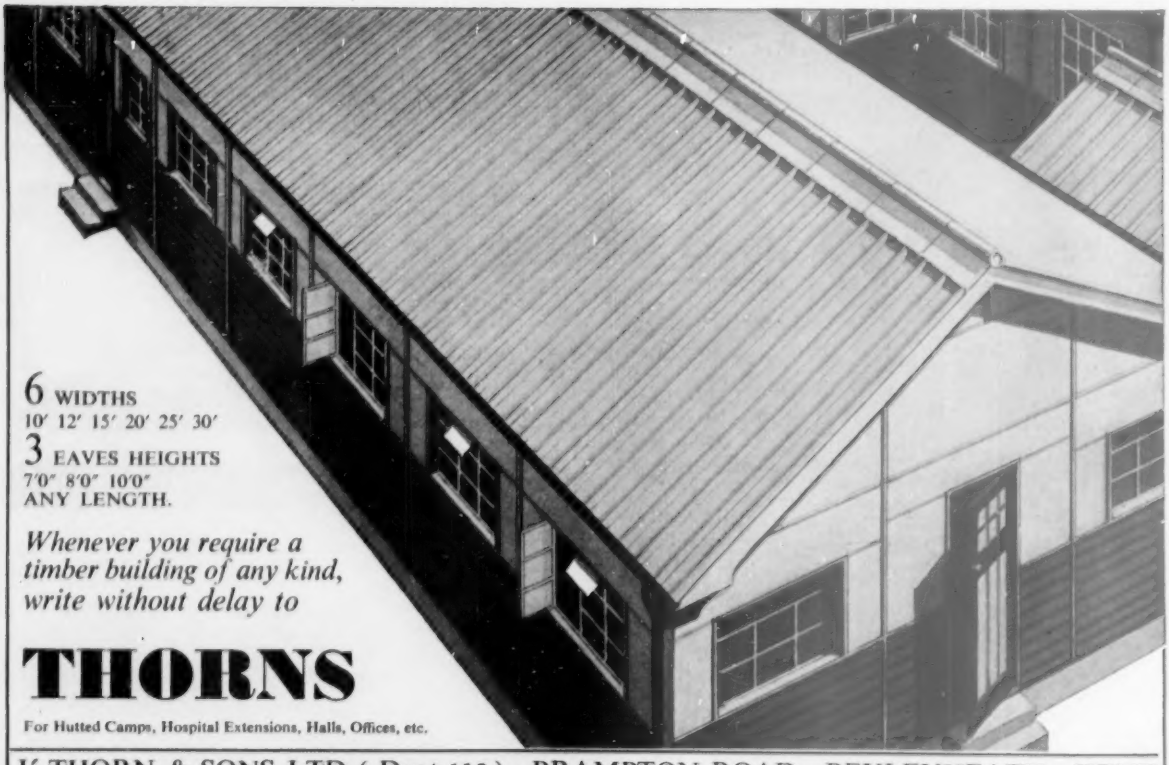
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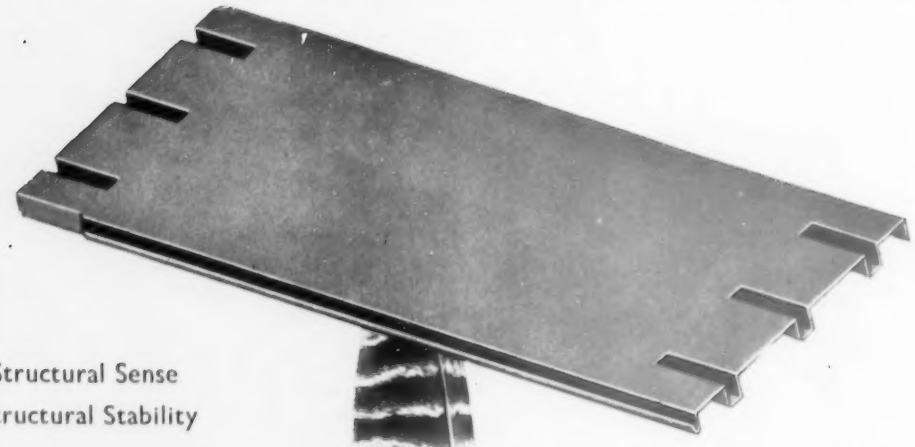
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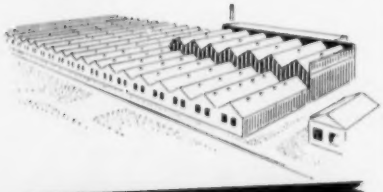


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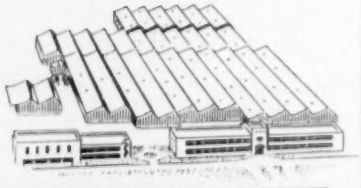
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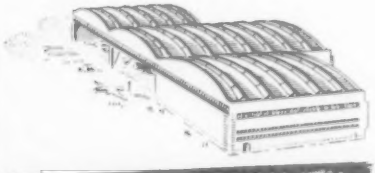
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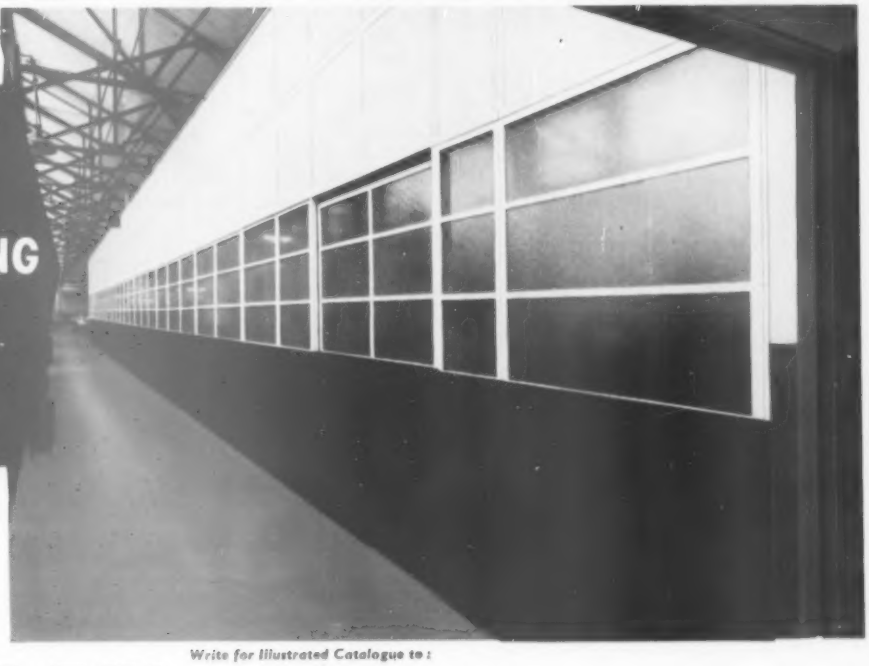
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Vol. 205 No. 20

THE ARCHITECT & BUILDING NEWS

20 May 1954

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THE British Architects Conference opens at Torquay on Thursday, May 27. As a guide to conference members, and for the benefit of readers who will not be attending, this issue deals with the architectural background against which the Conference takes place, and parts one to three of the Conference papers are published in full with some illustrations. As far as space has permitted, the redevelopment of the centre of Plymouth and Exeter are dealt with, and some examples of work done by private architects in the neighbourhood of Torquay and Truro.

F

EVENTS AND COMMENTS

THE ROYAL YACHT

I missed most of the fuss over the cost of and secrecy surrounding the Royal Yacht, so that I went to visit it with quite an open mind. The boat service from Tower pier to the ship was maintained by the ship's own boats. I went in a fast launch, or barge, decorated with silver dolphins and presided over by a young seaman whose complexion was about as salt as a pat of fresh butter. His looks belied him, for he certainly knew how to handle his boat. The *Britannia*, as you will have noticed in pictures, has very nice lines; she is not, perhaps, the prettiest ship that I have ever seen. I am a layman in such matters, but it seems to me that her hull is worthy of better-looking upper works. The after-part of the ship, which holds the Royal Apartments, seems to be bulky and out of scale with the rest of the ship and this is most noticeable when walking along the deck. I have no doubt that there was a reason for everything and that headroom was a problem, particularly in the large rooms towards the stern. She is, however, a fine ship. One thing about her outward appearance of which I heartily approve is that she flies much larger than normal flags. Flags are nearly always too small. If you look at any old print of sailing ships you will see that flags used to be large and splendid. *Britannia's* flags and ensigns are in this tradition.

Before I go any further, I want to say that I know that I am going to use a lot of seafaring terms wrongly in my description. I know the difference between a binnacle and a belaying pin but little else. Ex-matelots please bear with me, a simple pongo.

I first toured the working parts of the ship from the crew's quarters in the fo'c'sle, which were, I thought, very spacious and comfortable. The men still sleep in hammocks and not in the more modern cots and the more formal decorations alternate with the latest pin-ups. The galleys look much the same as those in any modern ship and have every possible aid to cooking. The laundry is enormous and highly mechanized. I was surprised but was told that even the latest destroyers have them now.

The navigating bridge has all the latest gadgets and dozens of telephones. Like most modern ships the wheel is under the bridge and rather surprisingly set to one side, although this does not affect the man at the wheel very much as he cannot see, anyway. The actual wheel is from King George V's racing yacht *Britannia*, and still bears its name and beneath it "R.Y.S." As a reminder of former days, there is in the wheelhouse a large photograph of King George V at the wheel of *Britannia* in a race. He is wearing that delightful peakless cap of which he was so fond.

On the upper deck behind the bridge is the *Britannia's* main armament, consisting of two very small two-pounders for salute firing. Among the nicer ship's fittings I noticed the solid brass belaying rack—I am sure that it is not called that—to which the signal bunting halyards are fastened.

Above the navigating bridge is the saluting platform—most of these names are guessed, for I saw no hand-out—a small, collapsible, glass box with three sides. It seems a great way above the main deck. It is floored with a piece of old red carpet and furnished with two brown-painted and rexine-covered steel stacking chairs.

The engine room is a blinding mass of white paint, shining brass and mirror-like chromium plating. It seemed quite small. I noticed that the main ladders were made of aluminium. Some of the notices on the engineers' board dealt with the working of the ship and were a reminder that a great deal has to be learned about the behaviour and mechanical working of a new ship, even by the experts who run her.

The ship's boats are more numerous and splendid than is usual. I looked down into the Royal Barge, a triple-screwed affair decorated with silver dolphins, a great many shining handrails and some simply horrid "sconce" type light fittings. Nearby on the boat deck I found a completely equipped engine shop containing a number of spare engines.

Aft of the funnel the whole character of the ship changes. Wide open decks which, because they are unencumbered by fans, ventilators and derricks, seem much larger than those even on far bigger ships. On the verandah deck stands the delightfully ornate white and gold binnacle of the Royal George which has been brought from the old yacht *Victoria and Albert*. The verandah behind it has walls of V-jointed polished hardwood in narrow widths and is decorated with old prints illustrating yacht construction.

The main Royal Apartments are reached from double doors on each side of the ship and it is on passing through these that you notice the great change. The decoration seems to me to be entirely satisfactory. By this I mean that it is exactly right for the job. It is formal without being pompous; it has a contemporary feeling without being fashionable; it has high quality without over-richness and it does not let you forget that you are in a ship. As you enter from the port side you arrive in a hall with stairs going up to the Royal bedrooms and down to guest and household bedrooms. To the right are two drawing rooms the full width of the ship, opening off each other and separated by folding glazed doors. The chairs and settees are comfortable and for the most part loose covered. Tables, bookcases and a desk or two are the choicest pieces from the *Victoria and Albert*. I particularly noticed an electric fire of interesting design in the second drawing room. Making a guess I would say that it was designed by Robin and Christopher Ironside.

The cornices of these rooms are variously decorated with small applied shells in plaster, coloured differently from the background. The hall cornice has separated narrow brass leaves about four inches long fixed vertically an inch or so apart. This is particularly pretty. One piece of furniture which I liked particularly was a small circular mahogany and gilt table with its centre mounted on a gymbal with a large steadying weight hanging beneath it. The light fittings throughout the Royal Apartments are particularly good. They do not embody any new principles but they are well designed and give a pleasant light and pattern to the ceilings and walls. I noticed that the elegant standard lamps had been fixed to the decks—presumably for safety reasons—in the most arbitrary places. One, for example, was tight against an upholstered seat in a window. The Royal Dining Room is magnificent. It is very large with a curved ceiling and the fully windowed walls are divided up into bays by short cross partitions.

The carpet, as elsewhere on this deck, is palish grey. The great semi-circular-ended dining table and chairs come from the old yacht. Curtains are a green yellow. The general colour scheme is light and lets in the maximum amount of sea light.

On either side of the hall are the Queen's and the Duke's private sitting rooms. Quite small and rather narrow they have specially designed desks to hold the large numbers of despatch boxes which bring State business. The Duke's room has a fine model of H.M.S. *Magpie*, which His Royal Highness commanded at one time, built in over the electric fire.

The guest bedrooms are large and extremely comfortable, most of the modern furniture is undistinguished and the bathrooms have overfigured plastic sheeting on the walls. Colours are, generally speaking, pleasant. Throughout, the pictures and prints on the walls have been extremely well chosen. Almost all are of royal yachts and other ships and a great many are delightful.

Once out of the Royal Apartments the design standard of the furniture comes down with a bump. Dark red and black carpets, treacly brown furniture, brown painted metal chairs and so on.

It is now an open secret that Sir Hugh Casson had a good deal to do with the decoration of the Royal Apartments but no information on this or anything else was supplied to the Press by the Admiralty. To anyone who knows Casson's work it was easy enough to guess where he had been and while the part he played was small in comparison with those of the designers and builders of the ship and its equipment it was important; and is a considerable contribution to the success of a fine ship.

ABNER

VISIT TO WINDSCALE

THE week ended May 7 was spent allowing small groups of journalists one day at the Plutonium Factory at Windscale. There is only one other known factory of this type, in the U.S.A., and the design was largely a pioneer work.

The first sod was cut in December, 1947. The Pile has been working for about four years. The M.o.W. were responsible for the building.

The Pile Buildings are 140ft high, the chimneys are reinforced concrete construction up to the filter and steel





frame to the filter and gangway which are at the top of the chimney as the requirement was not known when the base was designed and built. The top part of the chimney above the filter is rendered brick. An aluminium alloy lining to the chimney is supported by an internal steel frame with insulating fibre backing.

The Pile wall, which is 8ft 6in thick, was poured in three widths with staggered lifts, great attention being paid to the joints. Concrete finishes had to be very smooth, metal shuttering was used and the concrete vibrated into place, joints were ground flush after the shuttering was removed. Concrete mix generally was the usual 1:2:4 proportion, using a special low sodium content aggregate that had the greatest resistance to radiation absorption.

The mass concrete design above ground is often the result of the required thickness for shielding against radiation and not strength, 4ft of concrete is the equivalent of 18ft of water and 4in of lead. Expansion joints in the mass r.c. concrete Piles were not possible owing to the danger of leakage of radioactive particles. Consequently the design of reinforcement had to allow for very great stresses when maximum heat was reached in the Pile.

The fan blower rooms, a pair of which blow filtered air through each Pile, are 297ft long, 77ft wide and 46ft high, and have air filters in the walls. They are welded steel portal structures with steel deck roof. The very large fans are insulated from the floor slab by cork mats. Speech was impossible in the fan room; noise, vibration and low pressure were very uncomfortable. The main air duct to the Pile has dog-leg kink to prevent neutrons bouncing back. The large buildings are clad with asbestos cement sheet and patent glazing. Smaller buildings are of brick with concrete roofs.

The primary separation building is 200ft high. One of the main dangers appears to be of radioactive dust causing contamination, but no case of hurt from radioactivity has yet been experienced at Windscale. Thus great emphasis has been placed upon dustless surfaces, air filters at both inlets and outlets; stainless steel is largely used for internal pipework, containers, and floors in the separation plant.

The two operators are completely encased in protective clothing before entering a seriously radioactive area. They are standing on absorbent paper held down quite simply by adhesive tape. On leaving the area they will either remove their clothing and place it in a bin or, if sufficiently contaminated, they will be taken off on a trolley to a decontamination area; when the paper floor covering becomes contaminated it is easily replaced by a fresh supply. This is a technique used extensively throughout the whole works.

NEWS OF THE WEEK

R.I.B.A. Conference on the Design of Health Buildings

A recent survey of typical capital building programmes of Regional Hospital Boards indicates that in the course of the next three years the design of building projects will be in progress covering out-patient departments, casualty and accident units, pathological and orthopædic departments, and other specialist departments in addition to new general and mental hospitals. With the increasing housing development, specialist buildings of Local Health Authorities, including Child Welfare Centres, School Clinics and Aged Persons Homes, will also find a major place in the Building Programme.

The Council of the Royal Institute of British Architects have therefore decided to hold a Conference on the Design of Health Buildings. This will take place on October 21 and 22, 1954, and is to be opened by the Minister of Health, the Right Hon. Iain Macleod, M.P.

A programme of papers by distinguished speakers who are expert in the various aspects of the subject is being drawn up.

The R.I.B.A. Hospitals Committee on whose recommendation the Conference is being held hope that it will be of service to younger members of the profession who are attracted to this highly specialized work.

Further details concerning the Conference will be published later.

The A.B.S. Ball

The Rt. Hon. Sir David Eccles, Minister of Works, has consented to become Patron of this year's Architects' Benevolent Society Ball which is to be held on Thursday, December 9. The Ball Committee also announce that it is to be held at Grosvenor House. The move from the Dorchester Hotel has had to be made because larger accommodation is now needed; last year all tickets were sold a fortnight before the day of the ball.

The Ball is in aid of the Fund for Old People's Homes. The profits from the last Ball, amounting to £2,350, have now brought the Fund to £15,645 and the announcement of a competition for the design of the Homes is expected shortly.

Architects are reminded that this Fund is separate from the ordinary Funds of the Society which continue to need regular support.



The R.I.B.A. Architecture Bronze Medal: The Devon and Cornwall Society of Architects for the three-year period ending 31.12.53 has been awarded to Messrs. H. F. Walls (picture above) and C. H. P. Pearn, A.A.R.I.B.A., for their Canteen Building at Plymouth for Messrs. Tecalemit (picture at foot of page).

APPOINTMENTS

Mr. R. R. Burton, A.R.I.B.A., of Hale, Cheshire, has been appointed Assistant Architect (Group Leader), Grade IX and Mr. J. E. B. Smith, of Leicester, Assistant Architect, Grade VIII, on the staff of Mr. A. G. Sheppard Fidler, M.A., B.Arch., F.R.I.B.A., City Architect, Birmingham.

Mr. Burton was Senior Assistant Architect in the Housing Department, Manchester, and Mr. Smith Senior Assistant Architect in the City Architect's Department, Leicester.

COMING EVENT

The Architectural Association

May 26 at 8 p.m. Ordinary General Meeting. Talk on "Some African Studies," by Hope Bagenal, D.C.M., F.R.I.B.A., at 34, Bedford Square, W.C.1.

Building Advisory Service

The National Federation of Building Trades Employers has announced that it has, following discussions with the Ministry of Works, completed preliminary plans for the establishment of an Advisory Service for the Building Industry. The cost of developing the Service during the first two or three years will be met mainly out of Conditional Aid Funds.

The Advisory Service will be run by the National Federation, which has appointed a Committee of Management—under the chairmanship of its President, Mr. G. W. Grosvenor, which includes representatives of the Scottish National Building Trades Federation (Employers) and the National Federation of Building Trades Operatives. An officer of the Ministry of Works has been invited to attend meetings as an observer.

The Advisory Service will be available on request to any firm of building and civil engineering contractors in the United Kingdom, to make investigations and submit recommendations on:—

(a) Work Study and Site Organization (including Time and Motion Study, Methods Study, Mechanization and Materials Handling, Planning and Progressing of Labour and Materials on Site, and Bonus and Incentive Schemes);
(b) Costing and Headquarters Office organization and methods;
(c) Personnel Administration, including Management/Employee Relations, Training and Methods of Supervision.

The Advisory Service, if requested by a client, will also help to implement agreed recommendations and, in doing so, train members of the client's staff to deal with similar and associated problems in the future.

Special attention is to be given to the needs of small and medium-size firms.

Information on such matters as work study, costing, and personnel administration will be collected and made available to the industry. It is hoped that discussions, conferences and short courses will also be arranged.

The Committee of Management has appointed a firm of industrial consult-



ants to assist in the establishment and development of the Advisory Service. The staff will be selected from those persons with a knowledge of the industry who are suitable for consultancy work.

It is thought that the selection and training of the staff will take about a year and that the Service will not be fully available to the industry until some time in 1955. A limited service may be available earlier; if so the industry will be advised accordingly. It is hoped that useful information can be distributed to the industry at a relatively early stage.

When the Service is fully established charges will be made to the firms using it at a rate that is economic for them and will enable the Service to be self-supporting. The amount of time spent on assignments can vary from a few days to several months; this makes it possible for both small and large firms to use the Service.

The success of the Service will depend first on the selection and training of the right people from the industry, and second on the extent to which the smaller and medium-sized firms use the Service by asking for short investigations of particular problems. It is considered that the time and cost involved in establishing the Service will be justified because the Service should (a) be self-supporting within two or three years and could subsequently be expanded out of its own resources, and (b) eventually provide valuable information on the techniques of building management.

At a suitable stage during the training period a statement will be issued giving further details of the Service that will be available and full information as to the steps to be taken by individual firms of building trades employers who wish to avail themselves of the Service.

IN PARLIAMENT

Professional Charges

Mr. J. Harrison asked the Minister of Housing and Local Government whether in view of the heavy professional charges—legal, valuation, and architectural—involved in the purchase of land and houses, and the necessity to increase house purchase by people of moderate means, he would take action to reduce the burden of professional charges on such transactions. Mr. Macmillan said he was aware that these charges made a significant addition to the amount which the mortgagor must find as a deposit, but necessary professional services had to be paid for. The arrangements that he had announced recently should greatly help to reduce the initial outlay required from the purchaser.

Mr. Harrison pointed out that these professional fees were charged on a percentage basis; the building costs generally, and land in particular, had gone up about three or four times, and the professional charges had likewise increased and formed a substantial burden. Mr. Macmillan replied that there were great variations in the amount of work to be done. While he was trying hard to get further reductions, there could not be a flat-rate basis because of these great variations. One had to try to get an average as the basis. He would not agree with such a sweeping indictment as Mr. Ellis Smith's comment that professional charges were out of all relation to other charges in house building, and said that, on the whole, the professions had helped in every way, and would help more. (May 11.)

(There were two errors in last week's column. The Royal Institution of Chartered Surveyors was printed as Royal "Institute" of Chartered Surveyors and the Girdwood Committee was printed "Birdwood" Committee.)

* * *

CORRESPONDENCE

Electrical Floor Warming

To the Editor of A. & B.N.

Sir,—It is a pity that Mr. Moule's otherwise admirable paper, extracts from which appeared in the April 22 issue, should be marred by quite unrealistic comparison with other forms of heating.

Mr. Moule implies that heating engineers in general are prejudiced against the use of electricity for space heating and overstate the efficiency that can reasonably be expected from central heating boilers. On the question of bias I may say that I have been associated with the installation of electric heating in several sizeable buildings, some of them fairly well known: I.E.E. headquarters at Savoy Place, R.I.B.A. headquarters in Portland Place (storage systems) Bourne & Hollingsworth of Oxford Street, Chartered Insurance Institute of Aldermanbury, (direct systems) and as a result by invitation gave a paper at Savoy Hill on *Some Applications of Electricity to Space Heating of Buildings* which contains the following passage*:

> "It may be remarked, however, that the use of the embedded panel system enables smaller storage vessels to be used, because the panels themselves supply some thermal storage capacity.
>
> "The application of the thermal storage principle to direct electric heating appliances incorporating storage is also familiar. *There seems to be room for development of this principle in conjunction with floor heating* using soil-heating cables or some similar resistance suitable for embedding in building material. The thermal capacity of concrete is about 30 B.Th.U. per cubic foot per degree F. The heat storage of a concrete slab 6in thick, warmed through 10 deg or cooling through 10 deg between 70 and 80 deg F, for example, corresponds to 5 hours' heat emission at the normal rate of 30 B.Th.U. per square foot per hour."

* *Electrical Supervisor, April*, 1948; *Heating and Ventilating Eng., August*, 1948.

I am to-day no more opposed to electrical floor warming in appropriate circumstances than in 1948 but I must refute a basis of comparison which arbitrarily assigns an efficiency of only 40 per cent to solid fuel boilers generally without offering any evidence in support of such an indictment.

If Mr. Moule wishes to make a genuine comparison he might study the following points to advantage.

1. I, and other heating engineers, having used Orsat flue gas analysis equipment and other aids on field trials on boilers can talk about boiler efficiency from first hand experience.

2. Heating engineers have, for many years based "safe" estimates of anticipated fuel consumption on efficiencies ranging from 55 per cent for hand-fired coke boilers to 70 per cent or more for oil-fired boilers and if these efficiencies were unrealistic the basis would have been modified long ago because people are apt to be annoyed if the fuel bill exceeds expectations.

3. Impartial bodies such as D.S.I.R. Fuel Research Station, B.R.S. or I.H.V.E. could be asked for an opinion on whether 40 per cent or 55 per cent is the efficiency that might reasonably be expected from hand-fired boilers with semi-skilled stoking.

4. Mr. Moule makes no reference to other factors known by experienced heating engineers to be of importance in predicting fuel consumption of hand-fired solid-fuel central heating systems: for example, overheating and excess ventilation (window opening) the extent of which will depend on system design, control equipment, and other factors.

On the method of comparison given in the paper Mr. Moule may occasionally arrive at the right answer by the wrong route; more often the answer will be as wrong as the route.

The paper shows, unintentionally but nevertheless clearly, that people who have not had wide experience of many kinds of heating installations, in short, people who are not trained heating engineers, are unfitted to advise on the selection of the most appropriate type of system for a given set of conditions. Doubtless Mr. Moule will sometimes resent the heating engineers' verdict, which in the nature of things must often go against the use of electricity, but this will not necessarily mean the verdict is wrong. The referee is not always a popular figure, especially to a player who has taken an unconventional view of the rules of the games.

I am, etc.,

H. H. BRUCE,
Past President,
Institution of Heating and
Ventilating Engineers.

BRITISH ARCHITECTS CON



1



2



3

DEVON AND CORNWALL SOCIETY OF ARCHITECTS, 1953-54

1. **J. VIVYAN SALISBURY,** F.R.I.B.A.
PRESIDENT OF THE SOCIETY

2. **EDWARD NARRACOTTE,** F.R.I.B.A.
CHAIRMAN, EXETER BRANCH

3. **C. H. P. PEARN,** A.R.I.B.A.
CHAIRMAN, PLYMOUTH BRANCH

S. W. WARN, A.R.I.B.A.
CHAIRMAN, TRURO BRANCH

4. **H. J. W. STIRLING,** A.R.I.B.A.
CITY ARCHITECT, PLYMOUTH

5. **H. B. ROWE,** F.R.I.B.A.
CITY ARCHITECT, EXETER



4



5

Programme: 26-29 May

Conference H.Q.: Torre Abbey, Torquay. Tel. No.: Torquay 7763

Wednesday, 26th May, 1954

9. 0 p.m. to 11.30 p.m. — Informal Reception at the Marine Spa, Torquay, at which members are guests of the Devon and Cornwall Society of Architects.

Thursday, 27th May, 1954

10. 0 a.m. to 12.30 p.m. — Inaugural Meeting at Torre Abbey. Address of Welcome by the Mayor of Torquay. Address by Howard Robertson, President R.I.B.A. Paper on Building Materials and Techniques by W. A. Allen, Chief Architect, B.R.S., and Edward D. Mills.

3. 0 p.m. to 5.30 p.m. — Garden Party at Torre Abbey by invitation of the Mayor and Corporation of Torquay.

8.30 p.m. — Civic Reception at the Town Hall, Torquay.

Friday, 28th May, 1954

10. 0 a.m. to 12.30 p.m. — "Building Materials and Techniques," by W. A. Allen and Edward D. Mills.

Afternoon, *Tour No.* 1
Headquarters—Totnes—Dartington Hall (visit), Totnes (tea)—Paignton—Headquarters at 5.30. (half day.)

Tour No. 2
Headquarters—Newton Abbot—Chudleigh—Exeter (view reconstruction, tea)—Dawlish—Teignmouth—Headquarters at 5.30 p.m. (half day.)

Tour No. 3
Headquarters—Newton Abbot—Chudleigh—Mamhead—Kenton Powderham Castle (visit)—Dawlish (tea)—Teignmouth—Shaldon Maidencombe—Headquarters at 5.30 p.m. (half day.)

Tour No. 4
Headquarters — Totnes — Halwell — Kingsbridge — Torcross — Dartmouth (tea)—Totnes—Paignton—Headquarters at 5.30 p.m. (half day.)

Morning. *Tour No.* 5
Headquarters—Newton Abbot—Ashburton—Dartmeet—Princetown—Yelverton—Plymouth (lunch, view reconstruction, civic reception, tea)—Ivybridge—Avonwick—Totnes—Paignton—Headquarters at 5.30 p.m. (whole day.)

Tour No. 6
Headquarters—Newton Abbot—Bovey Tracey—Moretonhampstead (lunch)—Drewsteignton (visit to Castle Drogo)—Chudleigh Newton Abbot—Headquarters at 5.0 p.m. (whole day.)

7.15 p.m. for 7.45 p.m. — Conference Dinner at the Palace Hotel, Torquay.

Saturday, 29th May, 1954

Morning. *Visit No.* 1
Headquarters—Cockington (coffee)—Compton Castle (visit)—Headquarters at 1.0 p.m.

Visit No. 2
Headquarters—Kent's Cavern (visit)—Lincombe Drive—Babbacombe—Headquarters at 12 noon.

Visit No. 3
Headquarters—Paignton—Brixham—Berry Head—Headquarters at 12 noon.

FERENCE, TORQUAY, 1954

South Devon

A SINGLE article can do little more than cursory justice to the buildings of the southern part of Devon which is to witness the deliberations and excursions of this year's R.I.B.A. Conference at Torquay. I can, however, make a fair selection of the material available in a district whose older architecture is of substantial, if at times somewhat vernacular, note and which is now specially significant among our provincial areas for the actual or projected modern buildings of Exeter and Plymouth.

The two communities (each with its own marked identity) of Torquay and Paignton really need more time for the absorption of their varied intimacies than I have had available during my comparatively fleeting visits. Paignton, despite the nearness of Torre Abbey, was in the Middle Ages the more important centre, and a rich rural possession of the Bishops of Exeter. The outer walls of their spacious palace survive to remind us of the lavish state which those bishops kept. The church is of reasonable note for its structure and for an excellent late-mediæval pulpit of stone. Yet its best feature, of high merit among all our early Tudor work for the balance, ingenuity, and sophistication of its design, is the Caen stone screenwork, with a small tomb on each side of the central entrance, which parts the Kirkham chantry chapel from the main body of the church.

Torre Abbey is of more note than many of our monastic sites as showing the remains of a Premonstratensian Abbey. Not many houses of that order have left us much to see of their buildings, but where they still exist they are of interest, as the White Canons' rule made for architectural arrangements, including in particular the building of exceptionally short naves, which distinguished their churches from those of other mediæval religious communities. One can see these points clearly from the ruins at Torre, while the surviving buildings, including a great barn, are both of mediæval and Georgian significance.

Of Torquay itself it is well to remember that its growth as a resort started just early enough for it to have a few late-Georgian terraces and crescents, and a few more by Victorian continuators of the Georgian tradition. Yet most of Torquay, with its galaxy of churches by fashionable nineteenth-century architects, and with its Italianate villas, inspired maybe by Brunel's retreat at Watcombe and reminding us, as do Brunel's stations along his South Devon Railway, that the Riviera notion is of Italian origin, not French, is fairly and squarely Victorian. Torquay is thus a happy hunting ground for connoisseurs of *Victoriana*; it is, however, less repellingly exciting than contemporary Ilfracombe.

From Torquay one drives to Exeter through Teignmouth and Dawlish, and then past Powderham Castle whose Georgian plasterwork is more notable than its mediæval relics. Teignmouth and Dawlish are two "Regency" seaside resorts which have, with the vast growth of Torquay and Paignton, become much overshadowed and architecturally overlooked. Yet both of them, especially Teignmouth, have buildings of no small merit and interest, and one does well to remember that they both became resorts of fashion and taste when Torbay was still in its infancy as a rival to the more sugary sectors of the Mediterranean coast. Teignmouth, as its estuary and older streets prove, has also a long and honourable history as a seaport.

So in Teignmouth we have many bow windows and other domestic features of the "Regency" phase, also some good shop fronts, a remarkable, ogee-headed, churchwarden Gothic Gospel Hall, and generous quantities of ponderously Italianate (not Gothic) Victorian. The architectural highlights are the two churches and Den Crescent. East Teignmouth church, close enough to the sea for its chancel to be drenched at times with spray, is a fantastically neo-Norman rebuild, with slender wooden pillars and plaster vaults, of 1811-23. Contemporary with it is St. James' in West Teignmouth. Here a genuinely Norman West tower survives, but it is dwarfed to the east by an octagonal church. This is lit from above by a lantern in the manner of Ely, and has a truly brilliant interior, with its arches on slender pillars and its vaults newly painted in two shades of blue. I know no more lovely specimen of churchwarden Gothic at its best. Den Crescent, of the 1820s, is an excellent variant on the normal crescent design. For instead of a mere centrepiece, or an unbroken curve, the houses are in two separate blocks. Between them the more bulky Assembly Rooms (now a cinema) have a squat ground-floor Doric storey which recalls the lowermost

Widecombe in Dartmoor



Devon coast overlooking Teignmouth



South Devon

pillars at Carlton House Terrace, while above it a pedimented main feature has attached Ionic columns. Den Crescent, without doubt, is one of England's best pieces of seaside architecture.

At Dawlish the buildings themselves are of a lesser quality, though the villas of Barton Terrace are admirable, and many pleasant little Regency houses, some with bow windows or delicate ironwork, are in such roads as the Strand and Brunswick Place. Some fishermen's cottages, and an old mill with a very large waterwheel, survive as romantic elements in a deliberately sophisticated scene. The main interest of Dawlish lies in its basic plan. For as the cliffs on each side of the stream's mouth allowed no lateral expansion or "esplanade development," the late-Georgian resort grew inland, with houses on each side of the all-important valley with its "landscaped" stream and frequent waterfalls. The obvious parallel is the Steyne at Brighton. Up on the hills the Teignmouth-Dawlish area is well peppered with *cottages ornées* and distressingly overplanted with evergreens.

In Exeter one finds, where churches are concerned, that there is a vast gulf of merit between the architecture and sculpture of the Cathedral and the extremely modest structures of the numerous small parish churches of mediæval building or origin. The churches have, however, some good furnishings and monuments. St. Mary Arches is a happy example of how a bomb-damaged church can be re-roofed and generally refurbished, while the dull Victorianism of St. Mary Major (the spired church just west of the Cathedral) should not deter the visitor from going in to see its Baroque memorials from the earlier building. The Georgian architecture of Exeter was heavily diminished in the raids of 1942, but enough terraces, villas, and other houses remain to put the city very high among our repositories of the classic building tradition.

More interesting in a way, and certainly more questionably meritorious, are the new buildings so far put up in the areas of Exeter which were most scourged by the bombs. Not much has happened in the past twelvemonth to remove my earlier impression that the designers of the new Exeter's central areas have so far been somewhat timid even where they have genuinely tried to be contemporary, and that they have all too often fallen back on the tame neo-Georgian pastiches which Sir David Eccles has attacked in the City of London. Of the most recent buildings the best, in greyish yellow brick to mark it off from the prevalent soft red, is the range of shops and offices in High Street which is principally occupied by Messrs. Daniel Neal. One notices, too, that work is now starting in the bombed area between South Street and the ruins of Fowler's Lower Market.

The tours arranged for those attending the conference include several typical Devon churches. Such buildings as Kenton and Bovey Tracey (whether or not with later additions) well show the tendency of fifteenth-century Devon churches to run, with no clerestorys but with fine western towers, in three parallel aisles with waggon roofs. They also show how remarkably lucky Devon has been in the preservation of mediæval screens and pulpits.

South again towards Torbay one has Totnes and Dartmouth. Though both are on the same river, these towns are of very different nature, yet both can for some purposes be treated together as containing buildings of a picturesquely vernacular stamp. Totnes is one of Devon's best towns, with a motte and bailey castle, two ancient gateways and substantial fragments of its old town walls, and a Perpen-



Headmaster's House, Dartington Hall, Totnes. Architect: Lascaze



Torre Abbey, Torquay Conference H.Q.

Pennsylvania Terrace Torquay



Drum Inn Cockington. Architect : Lutyens



Clapper Bridge, Postbridge



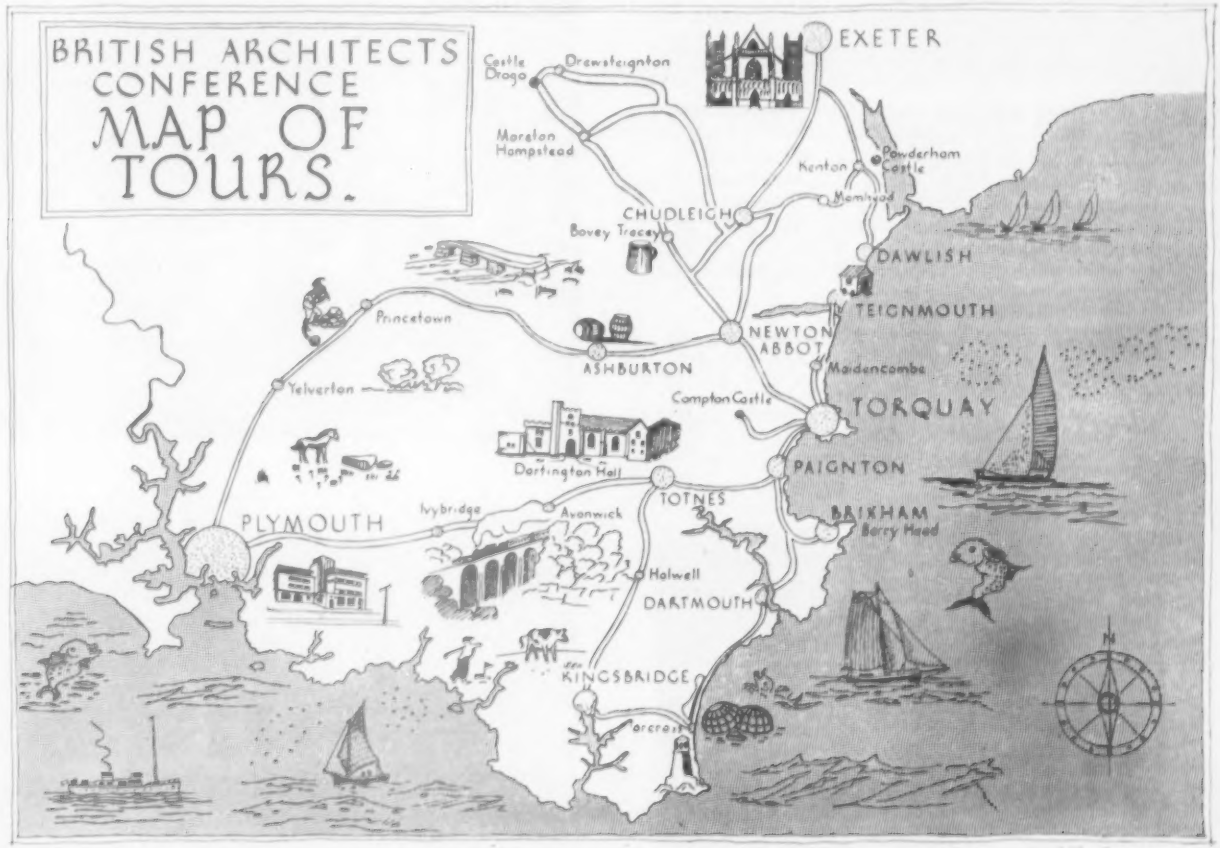
dicular church whose stone screen of the fifteenth century is probably the best stone screen in any English parish church. The tower, too, is important because it can be precisely dated (to 1449-52), and because its design was consciously related to other towers in Devon and Cornwall. The most sophisticated structure in Totnes is Fowler's splendid limestone bridge which was finished in 1828, but the town's main distinction lies along the course of its principal street, bisected half way up by a much altered mediæval gate. Below the gate are various late Georgian buildings, and gabled Tudor houses whose stone party walls recall the older parts of Plymouth. Above it one has a street scene only surpassed in Chester. Numerous houses, for the most part slate-hung but some of them with pilasters or half-timbering, project over the pavements and are supported, especially in the Butterwalk, by Georgian Doric pillars. The effect is unusual, and by reason of the early Georgian slate-hung fronts, decidedly vernacular. A fine slated eighteenth-century house, not running over the pavement, gives a classic warning of how the horizontal crimson slashing of Messrs. Woolworth can murder our historic architecture. Then at Dartmouth one has, in the recently restored Butterwalk, a fine example of how this technique of the "shaded pavement" had also been applied in the seventeenth century. Dartmouth also has a mainly Tudor castle and two ancient churches of first-rate interest, but one should not allow a quest of the antique to divert one's gaze from the colossally elongated, brick-and-stone-Baroque scoring of the South Devon landscape achieved by Sir Aston Webb when he laid out the great buildings of the Royal Naval College.

Last of all, and perhaps the most important, comes Plymouth. To one like myself, whose knowledge of the city is lifelong and intimate, the present situation there is of intense though somewhat tragic interest. Old Plymouth down by the Barbican, with its houses of Drake's time, amazingly escaped the blitz. The gutted St. Andrew's church, its main structure unaffected, is being reconstructed with painful slowness. Charles Church, an excellent Restoration Gothic building with a tower and spire of 1708, was also gutted and its interesting ruins await a decision on their preservation. The "new town" of Devonport, created to serve William III's dockyard, was terribly damaged in the war and much of what survived may yet disappear. Such future demolitions, along with the fearful wartime destruction in early nineteenth-century Plymouth, will make it hard in future, unless one consults books and prints, to realize that Plymouth was once among our choicest Greek Revival towns. One is left with Plymouth as a specially important example of a city where major post-war reconstruction has also seen a complete realignment of the central area's ground plan; the changes are in three dimensions, not two.

What has so far been built may fairly come under two main lines of criticism. The stores so far completed show a somewhat dull, unadventurous handling of their façades. The buildings by now finished along the new Royal Parade have not been permitted sufficient height in relation to the stupendous width of the actual thoroughfare. On both of these counts the most recent buildings of all are something of an improvement, and in general New George Street and Old Town Street (in the latter case along the old course) are better and more visually satisfying than Royal Parade and the beginnings of Armada Way. Of other new buildings the best is the Technical College, now nearing completion and a clean, simple, decisive composition by the City Architect.

The latest excitement comes with the newly announced project for the Civic Centre. Here, as with the Technical College, we have a scheme, and a challengingly ambitious one, put forward by the City Architect and his staff. The scheme is reviewed later in this issue.

BRYAN LITTLE



TORQUAY

AN important issue in Torquay is the provision of a new theatre and conference hall which the Borough Council's Entertainment Committee suggested should be provided by the redevelopment of an area behind Fleet Street and Abbey Place. Last November, the night before this project was to be considered by the Torquay Corporation, three local architectural students released a report giving their suggestions for a conference and theatre centre. Their plan is illustrated. Their names are: A. M. Decent, R. A. French and K. P. Tucker. The whole matter is still under consideration.

* * *

A new restaurant has recently been opened in Torwood Street, Torquay. The premises were converted into the "Regency Restaurant" by a local architect, Dawes Dingle. The accommodation for about 100 persons is arranged on five different levels. The decor is contemporary, and the place is well worth a visit. The general contractor was John Lloyd, Ltd.

* * *

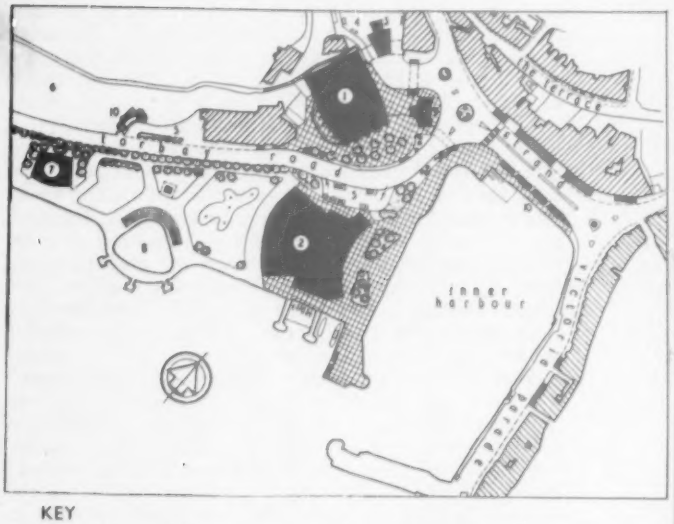
Other small works of a commercial nature have been carried out recently by architects both in Torquay and Newton Abbot. Of special interest is a small hairdressers shop, Maison Taylor, recently completed in Queens Street, Newton Abbot. Architects: Segar & Newcombe. General contractors: J. H. and W. R. Bovey & Sons.

Externally the small front is faced in local Ashburton marble and a small area of brickette tiles with joints running through in both directions. The marble is 1in thick, black, with rust-coloured graining. The shop-front frames are of Japanese oak. Internally the shop contains four cubicles, each with a lavatory basin and divided only by a light timber screen. The cost—£500.

* * *

Bungalows and small houses form a large proportion of the work of architects in private practice in this area, and on the opposite page are featured two houses designed by J. Evans and two bungalows designed by Edward Narracotte, both Torquay architects. The houses have concrete-tiled roofs and Snowcrete white-finished cavity brick walls. The

[Continued on page 596



KEY

1 Conference Hall. 2 Restaurant and offices.
3 Messrs. Slades. 4 Bus Station. 5 Car Park.
6 Rock Walk. 7 Band Arena. 8 Ice Skating Rink.
9 Lloyds Bank. 10 Shelters.



1 and 2 REGENCY RESTAURANT, TORQUAY

1

2



3 MAISON TAYLOR, NEWTON ABBOT

3



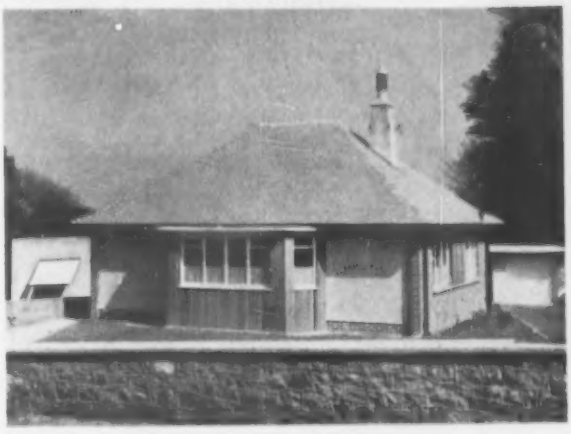


3-B.R.
HOUSE
TORQUAY

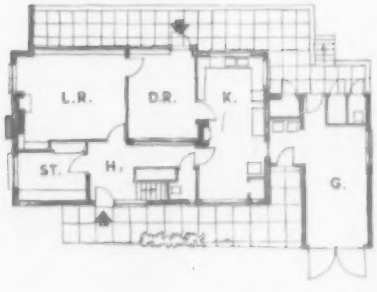


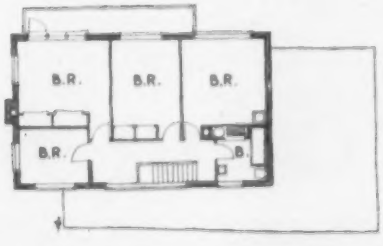


4-B.R.
HOUSE
TORQUAY



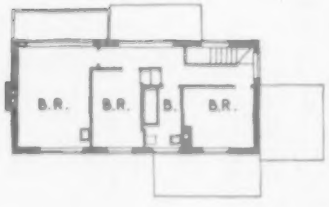
TWO BUNGALOWS, TORQUAY

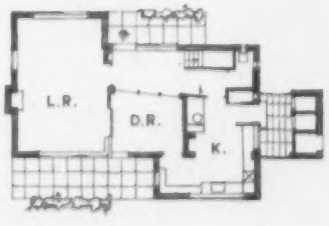






PLANS
TORQUAY
HOUSES





Newton Abbot

Continued from page 594

materials for the outside of the bungalows include brickwork, cedar shingles, cedar panelling and rendering.

* * *

One of the most interesting of local schemes is a self-help housing scheme designed by Dawes Dingle for the Newton Abbot Pioneer Housing Association. The housing owner builds his house in his spare time, so the design has been kept extremely simple. The houses are semi-detached, with central spine and end walls load bearing; the roofs are mono-pitched. Accommodation includes three bedrooms with lounge-living room, kitchen and bathroom on the ground floor. The price works out at approx. £1,300 each excluding the cost of land.

The same architect has designed buildings for Barton Hall Chalet Hotel, Torquay. The scheme is not completed, but includes concert hall, dining hall, and heated outside swimming pools, both for children and grown-ups. The chalet illustrated contains three rooms, each with two-tier beds.

* * *

Also at Newton Abbot is a small house with shingle roof designed by Segar & Newcombe and built by the builder without supervision by the architect.







1



2



3

1 SELF-HELP HOUSES, NEWTON ABBOT

2 CHALET, BARTON HALL, TORQUAY

3 SEMI-BUNGALOW, NEWTON ABBOT



HOUSE USING GRANITE "SPAWLES"

Truro

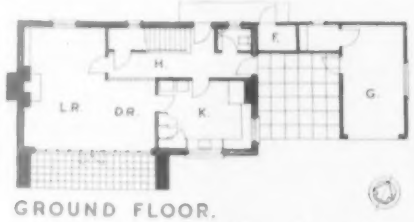
IN such a short review, it is only possible to show illustrations of some of the small houses designed by architects in Cornwall. On this page is a house by J. Vyvyan Salisbury on high ground in the centre of the granite industry of Cornwall.

In order to take full advantage of the sun, a large window has been provided to the living room, and as much protection as possible arranged to the loggia in front, in view of the exposed position.

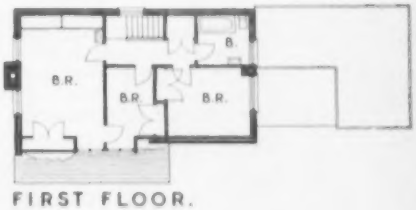
The granite used in the construction is known locally as "spawles," and is used for building hedges, and costs 5s per ton at quarry. It has been found that the walls can be made waterproof without any regard to the method in which the blocks are laid, which in turn means that the work can be carried out by a bricklayer.



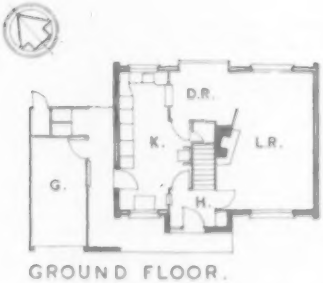
SECTION.



GROUND FLOOR.



FIRST FLOOR.



GROUND FLOOR.



HOUSE, TRURO



PIKE HOUSE, TRURO

Pike House, Truro, designed by Sheila Tribe, is built on a very narrow site with a magnificent view over Truro and the cathedral. The ground floor plan is illustrated above. The walling near the entrance front is coursed slate. The general contractor was C. Mitchell, Truro. The contract price for the house was £2,550. The other house at Truro was designed by Taylor & Crowther, architects of Truro.

EXETER

THE Baedeker raids of 1942 which flattened a large area of Canterbury's main shopping street, near the Cathedral, did the same for the northeast end of Exeter's high street and an extensive area west of the Cathedral Close. Both cities in the rebuilding of their blitzed central area have had to face the problem of rehabilitating sites previously occupied by private property holders, some of them small, and the re-alignment of street frontages. Both, to a lesser or greater degree have adopted a policy of thoroughfare improvement and the leasing out by the City Council of groups of building blocks to property owners and business concerns for the purpose of development. Rebuilding in the centre of Exeter will bear few surprises to conference members who visited Canterbury last year.

Stone dressings and local bricks—each building a Prince of good manners to its neighbour—have resulted in "safe," clean but uninspired architecture with shops at street level, wholly admirable for the goods displayed. The High Street must be paradise to Exeter's housewives after blitz and temporary shops, but to the motorist, shopping hours present a mass of people shepherded at frequent intervals by smartly helmeted "bobbies."

Plans to ease Exeter traffic congestion and to keep through traffic out of its main shopping street, form an important part of the Town Plan. Perhaps the most interesting road scheme is that for an inner by-pass. After considering Thomas Sharpe's proposals and that favoured by the Ministry of Transport, the route decided upon by the City Council starts at Exe Bridge at the southwest end of Fore Street (continuation of High Street), passes South of Cathedral Close, along an improved Magdalen Street, thence northwards to a roundabout at the east end of Paris Street; an improved Paris Street links up with the northeast end of the High Street to a new roundabout—East Gate Circus.

Within the rectilinear area thus enclosed are included, the Cathedral Close with its existing historic buildings and the fine Georgian terrace, Southernhay, where the Council at present have offices. The pedestrian shopping street (Princesshay) was envisaged by Thomas Sharpe. The plan illustrated on the facing page shows new buildings in solid black, buildings under construction are tinted, existing buildings cross hatched and proposals outlined.

Included amongst work completed in the Central area are the following:—

HIGH STREET, BEDFORD STREET & FORE STREET

Owner	Architect	Contractor
Currys, Ltd.	A. T. Pitassi	Stephens & Son (1941) Ltd.
Lloyds Bank, Ltd.	Chas. E. Ware & Son	M. T. Sleeman & Sons
Montague Burton, Ltd.	Staff Architect	M. Harrison & Co.
Peral Assurance Co.	Lucas, Roberts & Brown	A. E. Eveleigh
Commercial Union Assurance Co., Ltd.	Lucas, Roberts & Brown	Exeter Building Contractors, Ltd.
Westminster Bank	Lucas, Roberts & Brown	F. Brealy
Marks & Spencer, Ltd.	Lewis & Hickey	Bovis, Ltd.
Mark Rowe, Ltd.	E. A. Stone Toms & Partners	Thos Vanstone & Sons
Flemming, Reid & Co., Ltd.	E. A. Stone Toms & Partners	Thos. Vanstone & Sons
Wilson and Wymans	Lucas, Roberts & Brown	Thos. Vanstone & Sons
Ravenseft Properties	A. F. French & Partners	Sir Robert McAlpine & Sons, Ltd.
Devon & Exeter Savings Bank	R. M. Challice & Son	Soper & Ayers, Ltd.
Martins Bank, Ltd.	Lucas, Roberts & Brown	Soper & Ayers, Ltd.
Barclays Bank	Curtis Green & Lloyd	
Ravenseft Properties	L. H. Fewster & Partners	Sir Robert McAlpine & Sons, Ltd.
Ravenseft Properties	L. H. Fewster & Partners	Exeter Building Contractors, Ltd.
Colsons, Ltd.	Beech & Cooke	M. T. Sleeman & Sons, Ltd.
Barratts, Ltd.	Jerman & Radford	Stephens & Son, (1941) Ltd.
British Home Stores	Lucas, Roberts & Brown	Sidney Pratt (Builders), Ltd.

* * *

Outside the City centre the most interesting work undertaken by the City Architect and his staff are development of the Stoke Hill and Contess Wear estates, both of which are included in the first five-year programme of the development plan.

The Stoke Hill Housing estate won a 1952 Housing Medal. The estate is situated on 60 acres of ground on the northeast of the site. In the centre, and taking up a large area (13 acres), is a triangular-shaped area of statutory allotments. Around this area the first portion of the development had to be planned. Estate roads are planned in relation to contours and the whole layout was governed by the two main factors—undulating site and allotment area. Houses are both parlour and non-parlour types with two, three and four bedrooms. All are of traditional construction with local facing bricks, and clay and concrete roofing tiles. Houses completed and occupied number approximately 365. Eventually nearly 300 houses will be erected on the present allotment

[Continued on page 600

In Cathedral Close:—

THE CATHEDRAL



ST. MARTINS AND MOLS'



A GEORGIAN HOUSE





FROM THE CORNER OF BEDFORD ST.



RAVENSEFT PROPERTIES EAST SIDE OF HIGH STREET ABOVE BEDFORD STREET

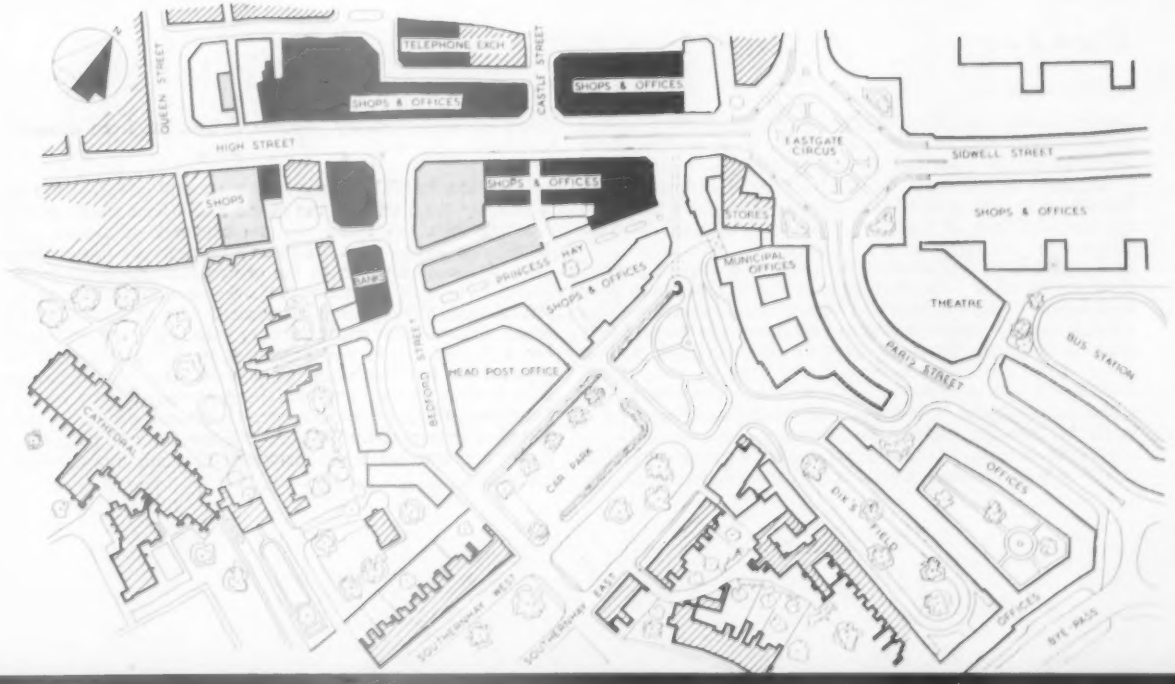


BARRATTS AND CURRYS HIGH STREET





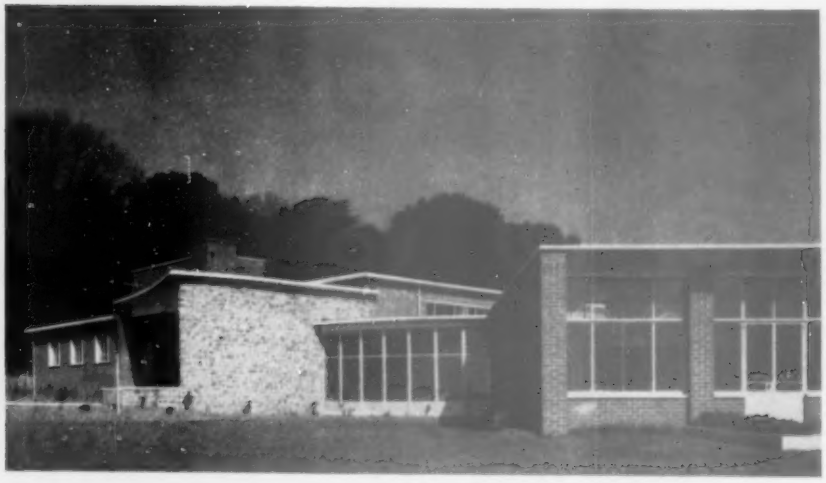
WEST SIDE OF STORE STREET





TORONTO HOUSE, STOKE HILL

INFANTS' SCHOOL, STOKE HILL







PRIVATE HOUSE

VINCENT THOMAS SCHOOL

Exeter

Continued from page 598]

land when this is made available. Shops are planned as part of the estate and two sites for Public Houses have been approved by the Licensing Authorities.

A group of dwellings for aged people is situated at the bottom of the estate and were made possible by a gift from the Lord Mayor of London's National Air-Raid Distress Fund.

The dwellings are situated on somewhat sloping ground with access off a service road behind the new main ring road which forms the southern boundary of the estate. The scheme includes accommodation for both single persons and married couples. Each dwelling is self-contained with a living room, kitchen, bathroom, cupboards, etc. Some dwellings have a separate double bedroom, whilst others have a bed recess in the living room on the ground floor and a single bedroom on the first floor over.

Schools include an infants on the estate, and a Junior mixed school on land which is adjacent thereto. A site for a future Secondary Modern School has been allocated.

* * *

The Countess Wear Estate lies three miles south of the city centre by the banks of the River Exe. The estate is well wooded with tall trees. In the centre is a natural pool with grass banks. A Church and Community Centre form part of the future plan in the centre part where shops and flats; flats with maisonnettes over, and a Junior mixed school have already been completed. An infants' school is under construction and a nursery school is planned. Sites for a Public House and a Secondary Modern School are planned on the south-east portion of the estate. Houses with various arrangements for living accommodation include from two to four bedroom types. Traditional dwellings completed, number about 360. Dwellings for old people are under construction and four-storey flats are envisaged for the future.

THOMAS & EVANS, MARSH BARTON



FLATS AND TERRACES, STOKE HILL





FACTORY, MARSH BARTON



MAISONNETTES AND FLATS, WEAR ESTATE

The Vincent Thomas Secondary Modern School for Boys, is not attached to a housing estate. It lies approximately three miles from the centre of Exeter to the north of the main Exeter/Honiton road. Pupils accommodated at present number 360, a total which will be brought up to 450 boys when six additional classrooms are added in the future. The main classroom block runs parallel with the contours and faces southeast.

The work on the Estates and school referred to above was carried out in the City Architect's Department. City Architect H. B. Rowe, Deputy City Architect, F. Mould, Chief Assistant, R. D. Fraser.

* * *

Exeter's Industrial Estate lies about a mile due south of the Cathedral at Marsh Barton. As yet there are few new buildings to refer to.

The factory for Messrs. Globelite (Architects: Lucas, Roberts & Brown) consists of an Air Ministry hangar giving a floor area of 100 × 125ft with an exterior wall of local facing bricks and stone dressing to the windows. The factory which is used for the repair of electric motors and dynamos is heated by high intensity gas unit heaters carried out by the local Gas Board. General Contractor, Soper & Ayers, Ltd. The same architects have added a new wing to a factory for Messrs. Thomas & Evans who produce soft drinks and squashes. The new wing on the left in the picture is rendered in Leamore sand to match up with the concrete cladding of the office block on the right in the picture. General Contractor, S. Pratt (Builders), Ltd.

* * *

The private house, illustrated, has a red-tiled roof, warm brown brick work, and dark red hanging tiles. The curved stone flower box to the bay window in front is of Pocombe local stone. Architect: Anthony Hollow.



PLYMOUTH

DISCUSSION has raged over reconstruction in Plymouth; Royal Parade and the uncompromising Portland Stone fronts which flank its Northern Side. The bold project for a Civic Centre off Royal Parade prepared by the City Architect gives a dominant centrepiece to the planning of this area, hitherto lacking. The scheme has been approved in principle by the City Council and a recommendation has been passed to form a sub-committee to deal with the phasing of the construction work.

People queued to see the model on view recently in Plymouth's Public Library, and attendance figures reached 500 a day. During Conference week the model will be at Maristow House near Buckland Abbey. A description of the scheme follows :—

THE basic conception of the scheme is the grouping of a number of large public buildings in such a manner as to give a feeling of spaciousness and vitality at a focal point in the City Centre and to present to the moving eye of the viewer a continuously interesting series of visual composition both in height and depth.

An important innovation is that the falling level of the site (a total of 18ft from east to west) has been fully exploited by forming the ground floor over the whole area on a level slab and the lower level is used for underground car parking and service area to the various building blocks.

It is intended that St. Catherine's Church shall not be retained as part of the completed scheme. It is understood that the church is not likely to be required by the Church Authority, and the building in its present state will be costly to repair and adapt for alternative use.

Careful thought has been given to the contribution each of the buildings will make towards the City Centre scene. If one imagines for a moment that the scheme as proposed is completed, from Royal Parade looking south up Armada Way one will see an asymmetrical composition designed essentially in three dimensions. The major part of the scheme is a great "place" or square stretching between Royal Parade and Notte Street with the dominating feature of the tall office block making an emphatic closure at the west side. Alongside and protruding forward into the square will stand the Council Chamber Block. This is considered the most suitable position for the Council Block. While it forms part of the prominent scene from the square, it occupies the "quiet" side away from concentrated traffic noises on Royal Parade.

Along the north side of the site and fronting Royal Parade, the Treasury Block has been sited. It is considered that the elevational treatment of this block with its large banking or rating hall will be more in keeping with the shop building on the opposite side of the Parade. Moreover, in this position it is more easily accessible by members of the public.

On the western side of the site, and fronting the cinema and theatre square, a restaurant block has been planned. It is considered that the introduction of such a building into the civic group, while serving as an amenity to members of the staff and public, will add liveliness in the evening so as to avoid the "dead" character so often associated with central area office precincts.

Adjoining this block and facing "Theatre" Square, a building housing the Registrar's and Weights and Measures' Departments has been sited. It has been located here to afford easy access for members of the public.

On the northern side and enclosing the site, the Court Block has been sited. Detailed planning of this building has not been considered at this stage as it is possible that the Lord Chancellor's Department will stipulate his requirements if and when it is decided to proceed with this building.

The Inner Square

The inner court or square has the appearance in plan of being entirely enclosed by buildings, but certain blocks have been raised up on columns affording views and access from the surrounding streets into the court. It is visualized that this square could be laid out in an ornamental manner with trees and sculpture.

The proposal to form the area of Armada Way between Royal Parade and Notte Street into a large square instead of the one-way traffic routes as recommended in the Plymouth plan, is suggested in order to facilitate traffic circulation, both to the Guildhall and Concert Hall on one side and the civic buildings on the other. With a large, open square, free movement and parking could be allowed to traffic during times when functions were taking place either in the Guildhall or civic buildings, and at other times traffic could be canalized by the use of guard posts and chains.

Æsthetically, the forming of a large square will not spoil the symmetry of Armada Way. It will have the tendency of combining the Guildhall, Concert Hall and Civic Building into one comprehensive whole.

Main Office Block

The principle of vertical communications between departments has been adopted, forming a tower-like building, compact and efficient to control.

The accommodation is so planned that the department will spread over more than two floors.

This building will house Corporation Departments requiring a total floor area of 112,000 sq ft.

This type of building is most suited itself to modular planning, which facilitates the use of standard components.

Lavatory units and services are more easily grouped and taken in a straight run up through the buildings and short and direct branches feed the various floors. Efficient natural lighting is afforded to all floors.

Heavy foundations are concentrated over a small area.

In buildings having horizontal circulation it is normal that this circulation space, which includes corridors, halls, staircases and toilets, taken up at least 30 per cent of the total floor area of the whole building. With main vertical circulation this percentage is reduced to between 10 per cent and 15 per cent.

(Continued page 604)

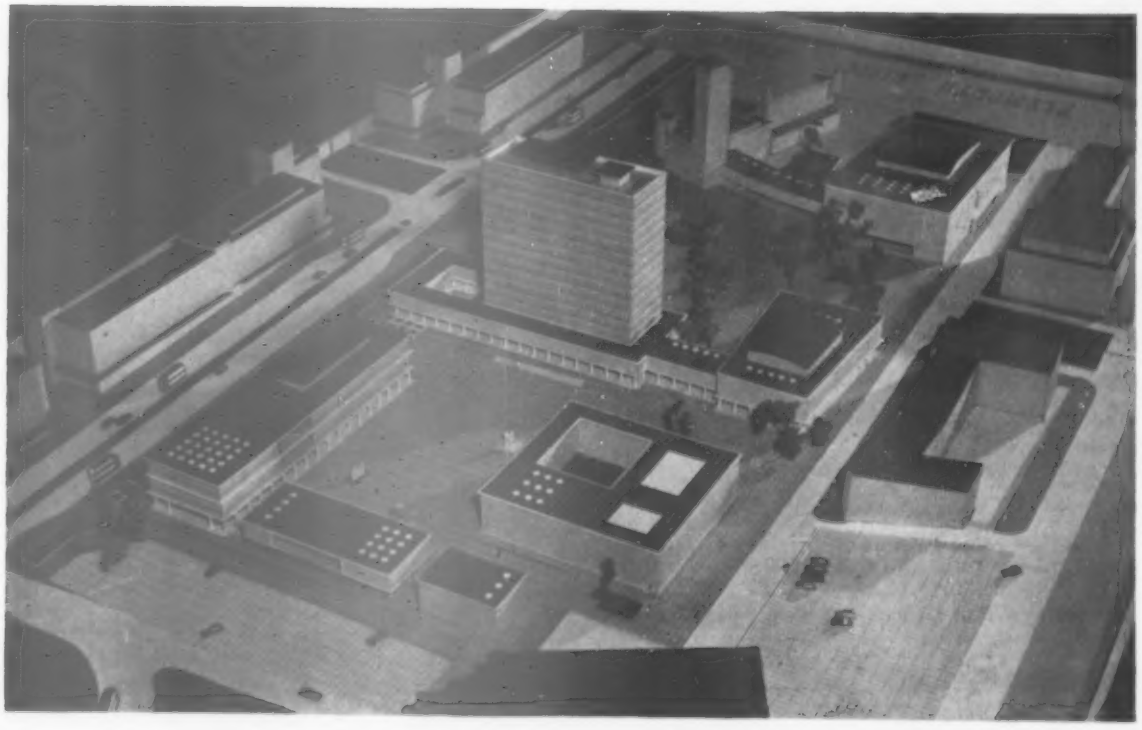
ROYAL PARADE FROM WEST



MODEL VIEW AND LAYOUT OF PROPOSED CIVIC PRECINCT



Photo : Western Morning News





PERSPECTIVE OF CIVIC PRECINCT

Plymouth

CENTRAL AREA

Continued from page 602)

The Council Building

Part of this scheme provides a series of interview rooms for councillors' use. This accommodation is considered as essential need, for here at the central offices appointments can be made for and kept by councillors at stipulated times instead of the present unsatisfactory and arduous duty they have to perform in attending to callers at their homes at irregular hours.

The Treasury

In addition to the Rates Hall and Motor Taxation Department, both of which have considerable and direct dealings with the public, the Administrative Offices of the Treasury will be contained on three floors over and will be directly linked by a main entrance hall to the departments below.

The Restaurant Block

Provision of a staff canteen has not been included in the office accommodation as it is considered doubtful whether a sufficient number of regular diners from the departmental staffs could be guaranteed to make such an amenity a financial proposition. Furthermore, the standard of quality and variety of meals provided by works canteens tends to be monotonous and unappetizing.

However, it was considered advisable to provide a restaurant block, separate from but part of the civic group of buildings.

Car Parks, etc.

The following is an analysis of the total car parking facilities provided in the scheme:

(1) Guildhall Square	140	vehicles
(2) The Great Square	400	,,
(3) Underground parking	300	,,
(4) Two-tier park	500	,,
(5) Restaurant block car park	50	,,
(6) Concert Hall car park	50	,,
Total	1,440	,,



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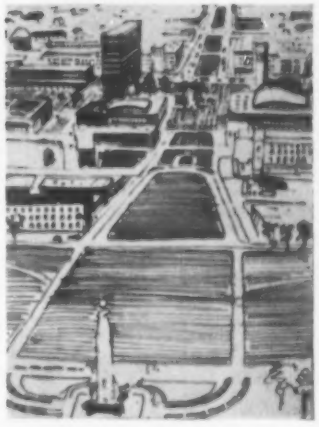
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3



ARMADA WAY, TOWARDS THE HOE. BARCLAYS AND N.A.A.F.I. ON THE LEFT



SKETCH OF ARMADA WAY AS PROPOSED



NORWICH UNION HOUSE

1 CO-OPERATIVE WHOLESALE SOCIETY, ROYAL PARADE

2 BOOTS LTD., OLD TOWN STREET

3 PEARL ASSURANCE HOUSE

4 GUILDHALL FROM ARMADA WAY

5 DINGLE'S STORE FROM ARMADA WAY

The following buildings are illustrated on these two pages:— Co-operative Wholesale Society Ltd. Architect: W. J. Reed. General Contractor: Plymouth Society Works Department. Boots Pure Drug Co. Architect: C. St. C. Oakes. General Contractor: Staverton Builders Ltd.

Royal Insurance Co. Ltd. Architect: Alec F. French & Partners; consultant T. S. Tait. General Contractor: Richard Costain (Plymouth).

Pearl Assurance Co. Ltd. Architect: Alec F. French & Partners; consultant T. S. Tait. General Contractor: Staverton Builders Ltd.

Barclays Bank Ltd. Architect: W. Curtis Green, R.A., Son & Lloyd. General Contractor: John Garrett, Plymouth.

N.A.A.F.I. Building. Architect: Messrs. Joseph. General Contractor: Lavender, McMillan Ltd.

Norwich Union House. Architect: Donald Hamilton Wakeford & Partners. General Contractor; Dudley Coles Ltd.

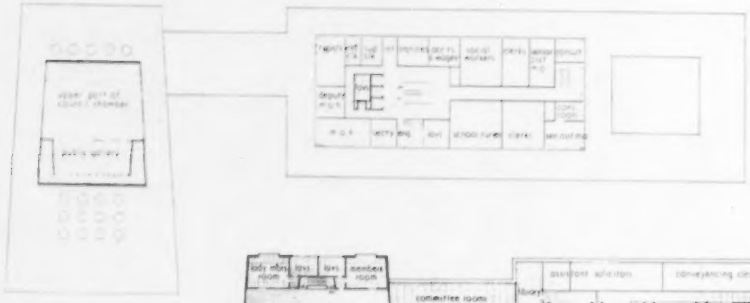
Dingles Store. Architect: Sir John Burnet Tait & Partners. General Contractor: James Longley & Co. Ltd., Crawley.



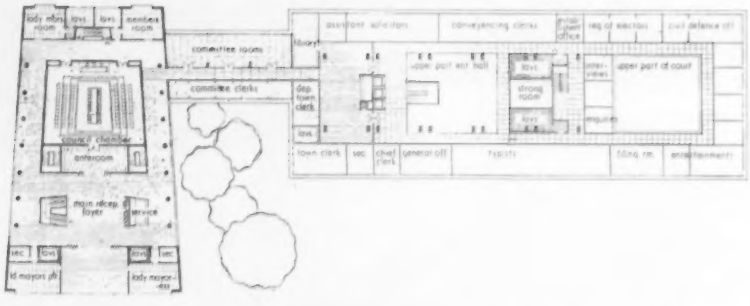
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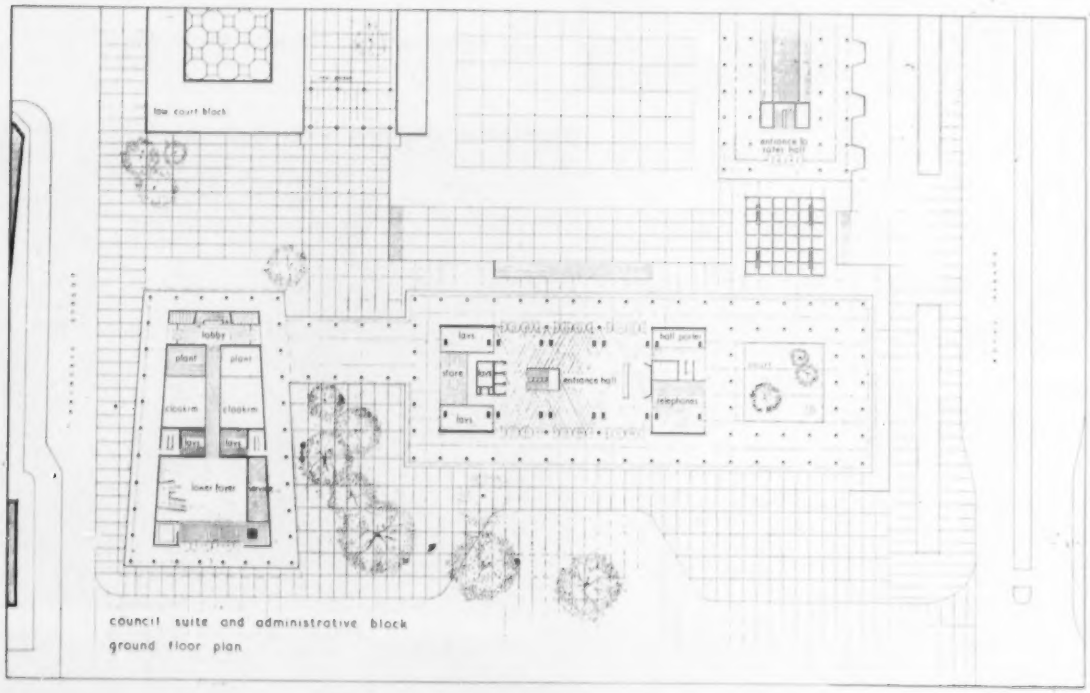


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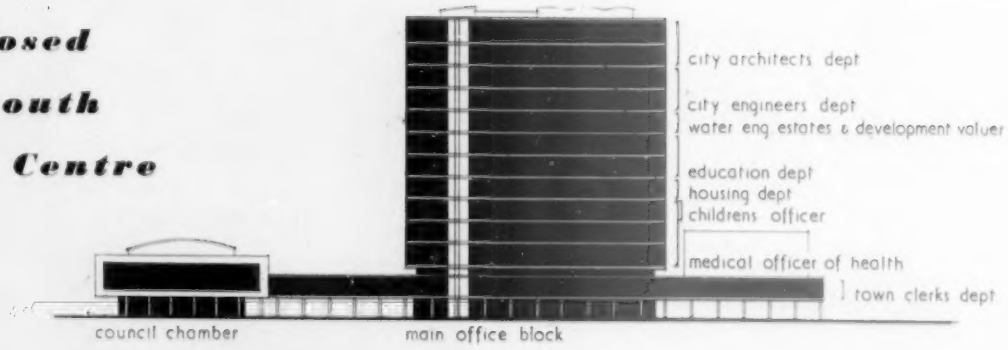


Typical upper floor, first floor and ground plans Admin. block.





Proposed Plymouth Civic Centre



Materials and Techniques



W. A. ALLEN



E. D. MILLS

Parts I to III of the paper to be read at the British Architects Conference, Torquay, on May 27-28 by W. A. ALLEN, A.R.I.B.A., *and* EDWARD D. MILLS, F.R.I.B.A., *the President,* HOWARD ROBERTSON, M.C., A.R.A., S.A.D.G., *in the chair*

IT is not possible in a single paper on building materials and techniques to do more than set the stage for discussion. This we have attempted by focusing attention upon what seem to us to be the significant trends and changes of to-day, hoping that the Conference will then by discussion sharpen the focus yet further and bring to bear the profession's practical experience to fill in many of the details of the picture.

PART I: THE FORCES OF NATURE.

It has been difficult for us to acclimatize our modern design and construction to conditions on these islands. Much of the trouble arose between the wars, for often what we tried to do then was inspired from abroad, or was new in some way and did not have built into it, so to speak, the toughness needed here. There are climates harder than ours in particular respects, but conditions in Britain are, in general, perhaps as hard as any in the world for building, and in such a mild climate it is difficult to give full weight to this apparent contradiction.

Fundamentally it is a question of moisture, for we have a persistently moist climate and moisture quickens chemical reactions and facilitates all manner of decay, and leads to all manner of dirtying and of changes of size. Even in the matter of frost we sometimes suffer more than we expect because of the likelihood of things freezing wet and then breaking instead of freezing dry harmlessly. And so our buildings—and our architectural ideas—are liable to quick deterioration if we import too indiscriminately and build too optimistically.

A classic example in one sense was the pre-war taste for smooth renderings, either because Continental architects used them successfully, or to make buildings look as though they were made of concrete, which was another fashion of the day. One trouble was, of course, that we failed to import the technique of good rendering in the Continental manner, soft surfaces not too inclined to shrink, and forgot also to add our traditional design precautions against dampness. Then, too, there was the peculiar stickiness of our atmospheric pollution, which made—and still makes—rendered surfaces especially look filthy here when they looked well elsewhere. And finally, having used a rendering unable to absorb water, very liable to shrinkage cracking, and very much inclined to look dirty, we often put it over bricks full of sulphate salts just waiting for water to pass into solution, and the result—very naturally—was frequent and dismal or even catastrophic failures. It was an unhappy adventure, part of an unhappy period when technology in the industry and the profession did not rise to the needs of innovation.

Defence against the attacks of moisture from the outside are not our only problems of wetness, for we have them in the structure as well. We make many of our building materials in dampness, we often deliver them in dampness, we store them on sites in dampness, and we build them into structures in wet weather, using a great deal of water to join them.

In a moist climate this is to some extent inevitable, and it follows that buildings will generally be very damp when they are new. Even nominally dry constructions only avoid the wetness of wet jointing materials; they cannot escape the atmospheric conditions. And so we must face the fact that we have relatively high moisture contents in our building materials when they are newly in place, and must accept the consequence that in the first year or two of a building's life, many of the bits and pieces of which it is made will dry out and get smaller. This has always been true, but to-day it shows more than it has ever done, for we no longer think it abnormal to provide heating and most of our new buildings are properly warmed. Consequently we have much drier internal climates than we formerly had, as witness the fact that when we put a heating installation into an historic building the first complaint is that all the woodwork, which for perhaps hundreds of years has been perfectly satisfactory, suddenly cracks. But much more than our woodwork cracks these days, so we must try to think our way towards a technique of construction that fits the modern facts.

There is an example in the fundamentally unwise course of employing the æsthetic concept of the flat, plane, simple surface when we try to make it by plastering (usually with shrinkable plasters) over a mixture of construction such as clinker block, brickwork and concrete framing, with perhaps an odd bit of wood framing and plasterboard. How can we expect anything but cracking? Every one of these things will pull away from its neighbour unless we are lucky, and our æsthetic objective will slip away out of reach.

It is the easy way of course, this kind of "plasticine thinking," but it is not good design. To finish right we must start right and think from the structure out to the surface, and from the surface back into the structure, so that the one registers the other properly, and the whole belongs harmoniously to the concept of the completed building.

Condensation is another of our moisture problems. Twenty years ago, it was something that we thought was very often curable by better ventilation or by more heat, or both. The last five years have seen it raise its head in new and rather unpleasant forms which we cannot yet appraise very accurately in advance. It is due to several causes, some of which sound very odd at first hearing, better thermal insulation, less ventilation, more air-tightness, and more use of thin impervious claddings.

Let us look at these more closely. Better thermal insulation, for instance—why should it lead to condensation? The trouble here may be its misuse, for when it comes on the inner side of a surface on which moisture may condense, it can prevent the surface from getting warmed by heat from inside the building, so that the surface gets colder and more certain to cause condensation.

Materials and Techniques

And what is this about ventilation? We have laid much stress since the war on not wasting the heat we produce, and we have worked towards better air-tightness and discouraged needless air changes; now we still get some relatively high humidities which we do not dissipate by ventilation, and we get them into unventilated cold cavities, and, of course, the moisture must condense out. It is bound to.

And then there are these impervious claddings, cold when it is cold outside, and unabsorbent, mostly of glass or metal. They give no opportunity as bricks do, or even concrete to some extent, for moisture to hide harmlessly in the pores and evaporate later; it must all lie on the inner surface until it rolls downward in droplets. Sometimes we find materials like wood-wool or fibre-board, attached to an impervious outer skin, and sometimes condensation does not then seem to happen on the skin, cold as it must often be. Why should this be? We presume the moisture then distributes itself in the interstices near the cold surface, hiding away as a high moisture content, somewhat as it does in brickwork, rather than as actual saturating condensate. Of course vapour trainers can give important help in controlling condensation, but the techniques are not yet before us fully developed.

The trouble is not that we do not understand the mechanisms, or cannot explain failures, but we cannot yet put numbers to the processes in ways which make prediction reliable. Both field and laboratory research are needed to clear matters up, and this will take some time; and so as architects we must presumably take refuge in some conservatism, or stick our necks out and learn from experience where the border lines lie. The point is then, let us learn corporatively, as a profession, by telling one another both of our successes and our failures.

There is a range of deeply important thermal problems in building design. It has, for instance, been very difficult for us to appreciate that a building, which looks so fixed and stable, is constantly in motion, changing its dimensions from hour to hour over a range which also varies from summer to winter. If no particular precautions are taken, the amount of movement will be of the order of 1in in 150ft as between summer high temperature and winter low. Unless it is minimized to a degree which will not ask too much of the elasticity of building elements, there will be cracking of walls and partitions and of the frame if this is concrete. Most of this will take place in the upper storeys where exposure is most severe, and if it takes place in the roof it may fracture the waterproof covering, especially if different parts of the structure next to one another expand at different rates and amounts.

The problem has become severe in our time because we have changed from relatively weak and discontinuous structures to strong and rigidly continuous types; and we use flat, continuous roofs where our fathers used discontinuous weak systems of tiles, metal sheet, and thatch. The latter tended to be foolproof, but the other is far from being so.

It is generally accepted now as part of our technique that we must provide expansion joints (and people who do not provide them generally get them provided in due course by nature); but this, of course, does not stop local troubles between expansion joints, for which the only practical treatment is to keep the structure as near to air temperature as possible by such means as the use of light coloured finishes for roofs to reflect solar heat, and thermal insulation to protect the roof structure. Is it generally realized that the difference in surface temperature of asphalt, in sunlight, as between a white and natural dark finish will be anything up to 50 or 60° F, and that between summer and winter it will be over 100° F?

One of the main points of a basically successful technique is, of course, to keep adjacent parts of the structure to much the same temperature, because contrasts mean differential movements and these lead to fractures. This suggests we must learn to be reasonably consistent in our reflectivities, not having adjacent things very dark and very light, or very different in thermal insulation. Our minds should focus especially on the junctions of walls and roofs, for that is the place most likely to trip us up.

Temperature differences we have always had, rigidly continuous structures we have not. That is what we must now recognize.

Pattern staining is another thermal problem, not dangerous in its results, but thoroughly unpleasant in the way it spoils appearance. And it is an annoying cause of expense in the way it makes redecoration necessary so soon.

It is all due, of course, to differences in temperature on the surfaces of rooms, most obviously produced on outer walls and ceilings when the structure is such that heat flows away from a surface at different rates in different places; but it is also produced simply by the effects of different thermal capacity. For instance, the mortar joints in hollow block partitions will show up because they have a bigger thermal capacity than the main area of the block, so that one part holds heat longer than the other. The plain fact is that on outer walls and in roofs, and to some extent elsewhere, we must not only avoid using constructions which have markedly different thermal conductivities, but should work generally towards substantially uniform insulations and masses.

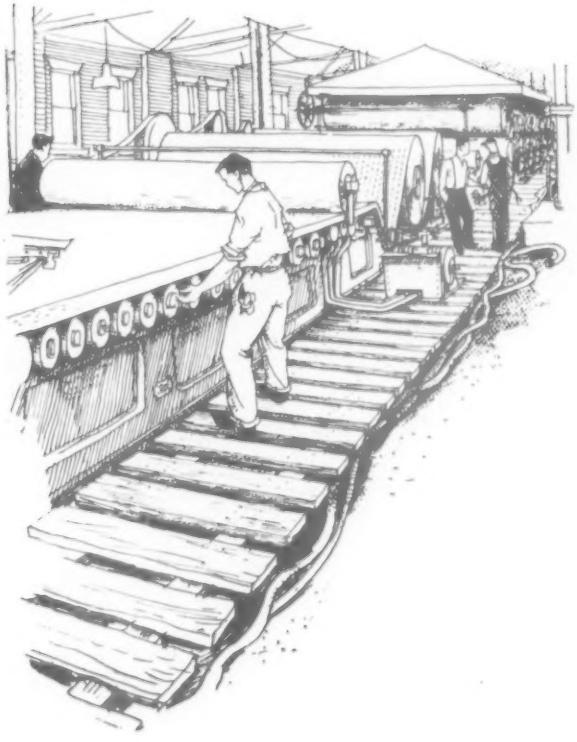
These are not the sum total of the natural forces we must respect in working our way towards fundamentally sound building practice, but they include some of the main ones and are at least representative. And the point of all this is that we must work out our building practice so that success "comes natural." All history tells us this is the way to work as a general rule, and that as long as we butt our heads against barriers we will hurt ourselves. The forces of nature will win in the end, and we are better off letting them have their way or side-stepping them, rather than trying to defy them.

[Continued on page 609



Thirteen-storey No-Fines Building, Stuttgart

"the place is full of steam...





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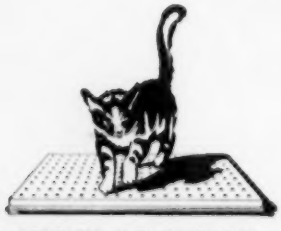
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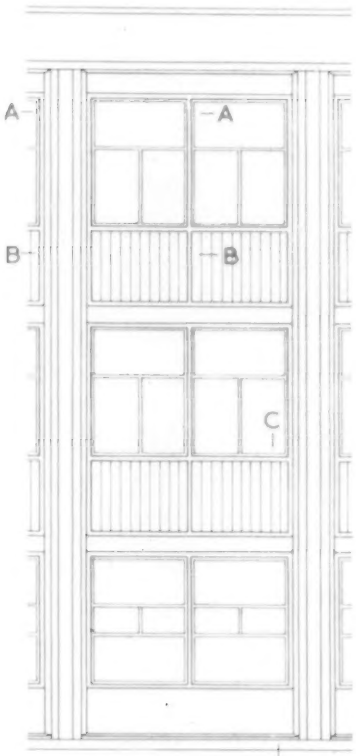
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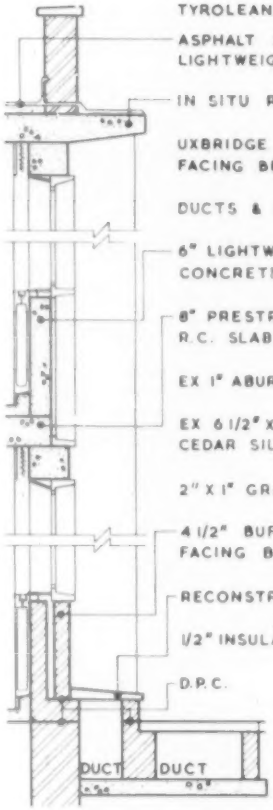
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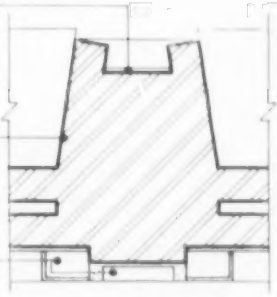


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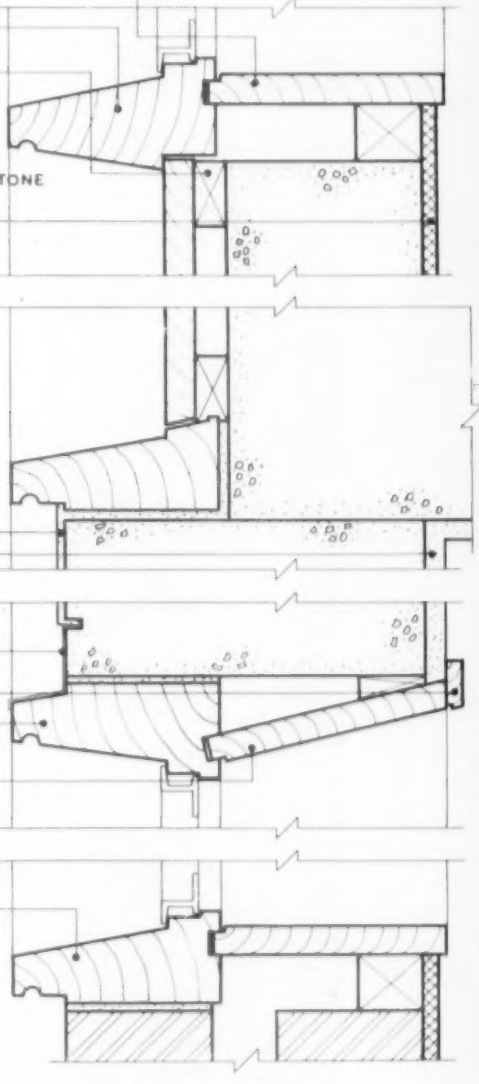
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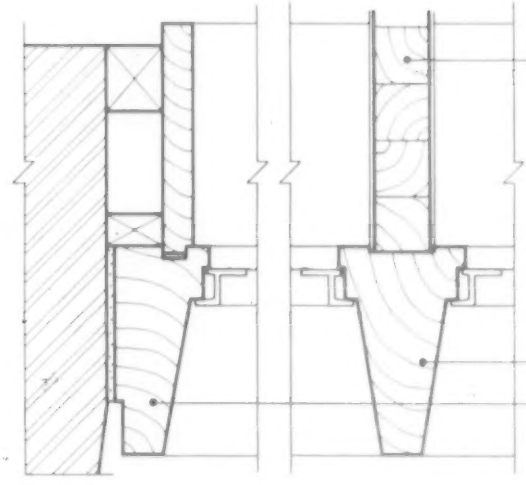
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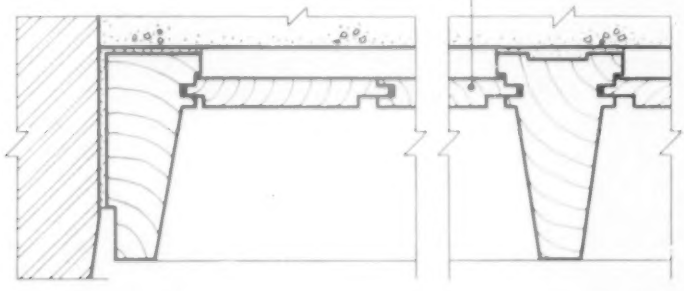
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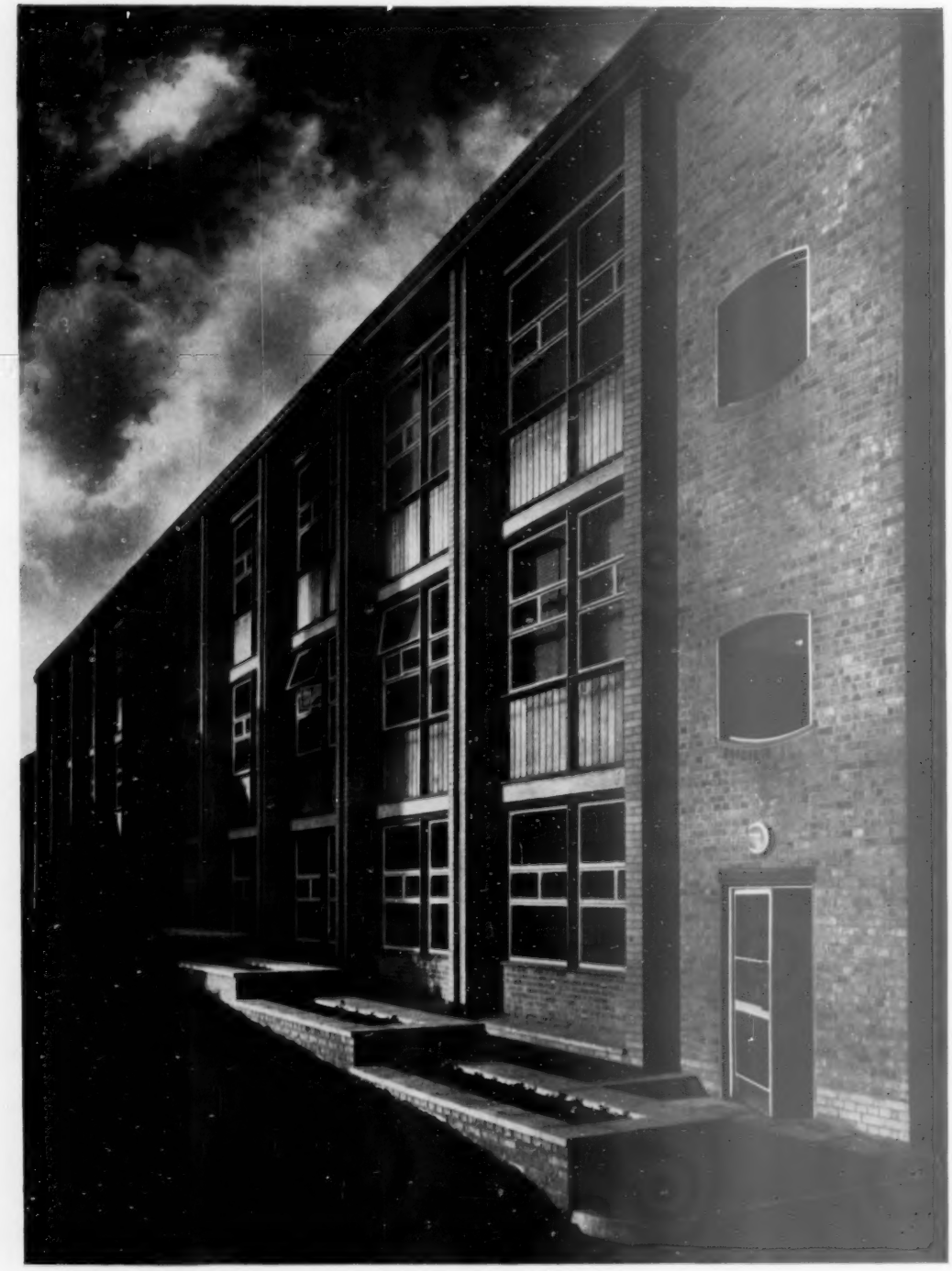


PLAN AT A A



PLAN AT B B

SCALES 1/4" = 1'O" & 3/16" = 1"



WALL DETAILS, HOSPITAL AT BALHAM

ARCHITECTS: DEVEREUX & DAVIES

Materials and Techniques

PART II—MATERIALS.

Now let us turn to the consideration of individual materials. There is no particular significance in the sequence in which they are discussed, except that the most widely established are considered first.

Bricks and other Clay Products

Some English clay brickwork is as lovely as any in the world, and bricks will no doubt continue to be used here in lovely or less lovely ways for a long time to come. But against them at present is some scarcity, apparently high price, high labour content in laying, low thermal insulation, and an inability to meet certain æsthetic demands. We cannot look entirely to substitutes to relieve the difficulties, so we must seek what comfort we may with clay. There are several interesting lines of development.

Perforating bricks is an obvious possibility and is already extensively done in Germany, the U.S.A. and elsewhere. The perforations reduce thermal capacity and increase thermal insulation (potentially by some 300-400 per cent). By the same token they use less clay and they can be fired more quickly, both because of this and because the holes permit penetration of the hot kiln gases into the units. The quicker throughput should lower burning costs and can increase production, and the lighter weight is an asset in transport and handling. There is still something to be learned about the best form of perforation to use for thermal insulation, but there is active continental research on this aspect, and the Building Research Station is doing all it can to induce British brickmakers to make perforated units. At least one-third of the industry, or some proportion of that order, can change apparently without undue difficulty. This is the kind of situation where architects can really help a great deal by formulating demands, for if they do not, no one will, and industry may not move. Local authorities used sometimes to turn down perforated brickwork as too weak, but this is nonsense, as will be evident later when we discuss whole structures..

The use of pulverized fuel ash is another very interesting development. Our power stations produce this as waste from the coal burnt in making steam, and at present it amounts to about 2,000,000 tons per annum, enough to fill the Great Hall at Olympia once a month. In 1960 it will be twice this amount. At present it has a negative value and it is very desirable to find a use for it. At the Building Research Station a programme of work is in hand for the British Electricity Authority, and it is now clear that the ash can be used very well in association with clay, to make bricks. And it could make a great many bricks, 1,000 million a year at present.

One of the unexpected things about p.f.a. bricks is that they are very attractive as facers, tending to be medium or darkish reds and greys, indistinguishable from some of the best-known makes. Good commons can be made too. The drying shrinkages in manufacture are very small, so that very fast drying and firing schedules are possible. This, together with the basic cheapness of the material, could (like perforation) apparently lower costs, which we must hope will be passed on to us.

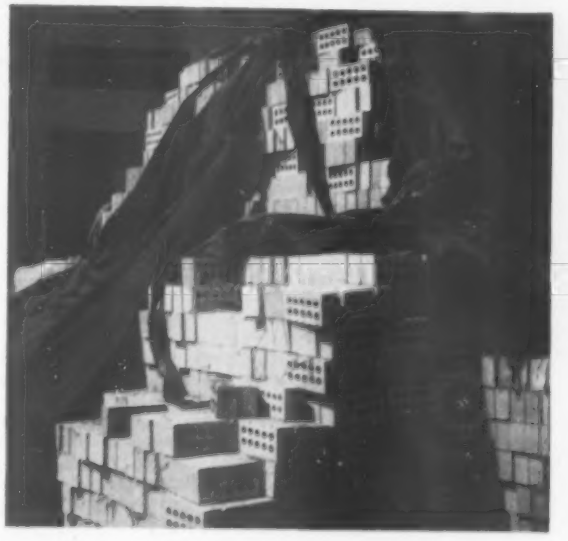
While it is not always impracticable to take ash to the existing brickworks, the fact that in many cases it can usefully form at least as much as 85 per cent of the body of a brick suggests that the sensible thing to do mainly is to build brickworks at power stations, and bring the clay in if necessary. In other words, treat these brickworks as concomitant parts of power stations. The first experimental brickworks of this kind has just been authorized at Hoddesden, and the output will be used at Harlow. At some of the power stations under consideration, ash output could produce as many as 100 m. bricks per annum, and could thus greatly influence local supplies. The drying shrinkages are small, and this not only should encourage dimensional uniformity but opens up other possibilities such as the production of relatively large clay slabs. There should be a substantial demand for clay units of this kind for the facing of buildings, and the part they could play will become more evident when we discuss claddings.

There are regrettable æsthetic limitations in brickwork, in colour, texture and shape. In colour we have principally soft reds and red-greys, or soft yellows, which go greeny-grey with time. These are not high enough in key, nor is the texture always right for present design requirements, and they change under the weather. One of the interesting clay finishes in use in the U.S.A. is a glaze termed manganese spot, which is a spatter of dark brownish-grey on a whitish base, producing very fine looking greys, and the bricks themselves are remarkably uniform in size, partly due to American clays, but more to high grade technical control in some of their works. Bricks of this type have been used in some of the new buildings at Harvard University which the authors have seen, and their trim preciseness, together with a recessed joint decidedly has its attractions. And of course it washes clean, which can be very useful. In the same vein are some American yellow bricks used often for industrial buildings, for they are very hard and wash clean—a specially valuable attribute in industrial areas. Both these types of brick will be on display at the Conference.

Another most interesting brick development in the U.S.A., not yet cheap but certainly useful, is the pure-coloured glazes used by Saarinen at the General Motors Technical Centre in Detroit. These seem to be glazes applied after first manufacture (and presumably the twice-firing makes for the expense). The colours are magnificent, however, and could meet the oft-felt need here for pure, permanent colour outside our buildings, without going outside our traditional building techniques.

An interesting finish, mid-way between a glaze and the natural self-finish of the clay, is the terra sigillata of classical times that has been revived to a limited extent for special ware on the Continent. It consists in coating the unfired ware with a specially prepared suspension of the finest particles of the clay from which the ware is made. It gives a lustrous matt finish in a once fired process and should therefore be cheaper than a twice-fired glazed product. Any surface intermediate between matt and glazed can be obtained by blending varying proportions of glaze with the clay suspension.

We are entitled to ask if the brick industry is interesting itself in meeting anything but traditional demands in appearance. We see few signs of it, and with the exception of some parts (including fletton production) not as much interest as we would like in aids to efficiency. Why do we see, for instance, so little interest in hollow clay blocks? On the Continent we find finely made blocks in vast quantities from the North Sea to the Mediterranean, and in the U.S.A.



American Perforated Bricks

Materials and Techniques

another range of accurate, ingenious blocks, self-finished with grey, ivory and other glazes, and in good proportions for external and internal presentation. Some of them are even made with glazes on both faces, to form fair-face work both sides, most valuable for factories and other such building needs. And with present brick-laying rates, a valuable time-saver in laying.

It is a little unfair of course to blame the industry entirely for their lack of innovation because as a profession we have not focused and voiced many demands beyond the traditional. Partly this is due to the fact that many of our own best innovators have been told to keep their hands off bricks since the war, to leave them for housing work, and partly no doubt it is due to the attitude which affected some of us at various times, when we came to regard the use of brick as a defeat, if not actually immoral and traitorous to the advance of modern architecture. But brickwork is still the sharp competitor on price in many parts of the country, as well as being the backbone of the industry, and so we should perhaps invite the industry to explore with us these and other new possibilities.

The urge among us to find an extended range of brick colours and textures is reflected in the way our professional eye roves hopefully over the field of sand-lime and concrete bricks, finding often something that is more nearly to our taste, while we recall uneasily the problems of shrinkage which demand such careful specification, supervision and workmanship that we know we may fail to get any one of these and get a failure instead. But it is significant that we do not give up hope of finding something of what we want in these alternative types of bricks.

One of the substitutes for clays since the war has been the lightweight block, mainly either of foamed slag or clinker, both offering sufficient load-bearing capacity for inner leaf work in housing and improvements in thermal insulation, with reduced thermal capacity. Reluctance on the part of some architects and many local authorities to use them has now been so amply demonstrated in many cases to be nothing more than pointless prejudice and an unwillingness to examine evidence that one hopes—perhaps idly—that it will suggest a more lively and understanding approach to new developments in the future. At the same time even this remark must be made with an eye to the fact that clinker supplies now are not so easily able to meet demands, and a risk of shortage is so evident for the future that the use of pulverized fuel ash is being developed to make sintered aggregates to take their place.

Even in the question of block production we have a disappointing comparison to make with the U.S.A. Few if any of our lightweight blocks are sufficiently well-made to be left exposed to view, but in the U.S.A. this has become quite a regular practice, both internally and externally, the only finish usually being a cement-based paint, though emulsion paints and oil paints are sometimes used. The authors have seen them in factories, office blocks and housing, and they can be very successful and cheap. Yet it is almost impossible to rely on the British block-making industry to make a consistent block of the right texture, and deliver it without damaged edges. The worst of it is that we see no urge to solve these problems.

Stone

We all know that stone is generally more expensive than brickwork. The cost differential has been increasing steadily for a long time and is now considerable. Yet stone is in many ways a very attractive facing, and we want to keep it in our vocabulary not only as a material for the expensive "one-off" job but for more general use. What are the prospects?

Fundamentally, the competitive use of stone depends on improved quarry efficiency to lower the winning cost (which means investment in an uncertain future unless we can establish the market), on having a type of stone easy to work and accepting simple finishes, on avoiding ornamental shapes, and on simplified site work. Stonemasonry as a craft probably plays little part in all this, for the hand-dressing of stone can consume a great deal of labour, and that is what we must avoid. Probably it means either choosing varieties that can be prepared and used as thin cladding, which will be discussed with other claddings later, or using sawn blocks or hammer-dressed rubble as one leaf of a cavity wall.

The slate industry is a slightly special and saddening case. Slate is a lovely flooring material—there is a delightful area of it in the Festival Hall in front of the platform. It also makes a good entrance slab, and F. R. S. Yorke has used it charmingly for front-door canopies in low-cost housing at Harlow. The Herts schools have it at the base of the outer walls, and there are good sills and other trim to be had. There is a feeling of enterprise here, yet the industry suffers the great economic disadvantage of the remoteness of their quarries, which adds to its direct transport costs and also makes it difficult to find economic outlets for quarry waste. It is a difficult problem, and as a profession we should consider how we may help.

There is little more one can say in a general way, except to add that if we want stone we shall have to get together with the industry not only as individuals but as a profession. Perhaps the first step should be to bring both sides together in a symposium at the Institute.

Concrete

Reinforced concrete came into use in this country about half a century ago. Up to the end of the first world war it was treated as something to be done by specialist firms, and it was, on the whole, done well. It was seldom left exposed, however; most commonly it was rendered. Buildings built then, in that way, have survived well but generally look very drab.

Between the wars sharp changes took place; the specialist firms gave way to general usage by ordinary contractors (who reduced it on the site to labourers' work), and architects decided that here was new raw material for architecture, to be left exposed as a true expression of structure, and reduced in section to the most elegant dimensions possible. Quality of work seemingly went down, but the need for quality went up.

The result has been a very clear demonstration that *in situ* reinforced concrete, used like this, cannot be relied upon to have a trouble-free life of more than about 25 years. And although our climate is a contributor to its deterioration, similar results occur on the continent, where even in sheltered places, for instance, on pilotis and the roofs they support, great spalls have begun to appear on buildings only 15 or 18 years old.

The weak points in *in situ* work are the thinness of cover over the steel and the unreliability of workmanship. It is clear now that all steel—not just the main bars—should have a cover of probably 1½in, which will add to cost and often detract from elegance. And as for workmanship, the specification of mixes and water-contents alike are often senselessly ignored on many sites in the presumption that what looks right is likely to be good enough. If we are to use



Timber Curtain Walling, Harvard, U.S.A.

reinforced concrete really successfully in our grammar of contemporary design, then we must not only give the matter a great deal of thought ourselves, but insist upon the industry doing its part to raise standards quickly.

Even so, it is questionable whether we should leave *in situ* work exposed, and we would be wiser perhaps to plan generally to cover it, as for instance the Swedes do increasingly, often using wood or metal. Ceramic tiles might be another popular finish if one could be sure of adhesion, but this is a problem, as we will see later.

Some of us have trusted concrete too far in other directions. It is deceptively stable in appearance and tempts one to build up a sort of box-æsthetic where we depend on horizontal slabs staying horizontal; but we are sometimes nearer the truth if we think of thin concrete slabs more as cloth stretched over supports and likely to sag. Some of the most interesting pre-war architecture in this country is unhappily suffering in this way. Another worrying feature of exposed reinforced concrete is its tendency to crack at every major change of section.

It must be emphasized that we are dealing with exposed concrete, though sagging is characteristic in floors and indeed in any concrete section which is not very stiff. Probably our recent vault and arch roofs will not give us headaches of this kind because their shapes are usually so very stiff.

We should not leave *in situ* concrete work without mentioning the development of prefabricated reinforcement. It is somewhat of a mystery that we have waited so long for it. An interesting variant on this theme in the U.S.A. is reinforcement for floor slabs supplied welded to corrugated steel sheet, which then forms a permanent shutter. It is all very quick and accurate, and specially well suited to situations where suspended ceilings are to be formed. Trends of this kind are bound to develop now.

A real advance here since the war has been in the precasting of concrete facing slabs, and this part of the industry is perhaps now as good as anywhere in the world. Products of good quality can be obtained and the finishes are often elegant. Crushed brick, crushed stone, and gravels have all been used exposed in ways which give an excellent appearance. Quality is not automatic, however; one must be ever watchful with concrete.

Plaster

Plaster is basically a cheap and versatile material, as old as building itself, but its versatility is not fully exploited yet, nor do we get trouble-free work, so we must stay for a moment to discuss it.

With wet plastering, no doubt the biggest change coming over the field is the introduction of vermiculite aggregates in place of sand. Vermiculite is relatively cheap, and a ready-mixed material by combining it with gypsum plaster is available.

Several functional merits are claimed for this development—reduced condensation, improved sound absorption, and so on—but the biggest legitimate claim is that it is easier to handle and therefore quicker to apply. If we really can get these economic benefits of easier working passed on to us and our clients, it will be a very satisfactory development. But we must keep our eyes open for troubles also.

Plasterboard as a plaster base is worrying some of us. Although shrinkage is said to be so small as to be almost harmless, it does not seem to be so in practice, and especially in the warm and dry buildings we are building now. Small but annoying cracks appear between boards or if some joints hold by scrim, larger cracks open between larger areas. Even nails seem sometimes to get left proud and eventually dislodge spalls of plaster. Is this general experience, or the occasional case, and what can the industry do about it?

One answer may be to use it without plaster. The main objection has always been that tape-covered joints look objectionable, but the type of board which is tapered towards the edge is said to be able to be used in such a way that no joint shows. The meeting edges are taped, and a special plaster mix fills across the thinned area flush to the main face, apparently blending to the paper so well that decoration can be applied directly without, as we said, showing the junction. This kind of board has been available here for some time, but has not yet enjoyed the popularity which its counterpart in America seems to be having. It seems that there the jointing is often truly invisible when painted. The question is whether it will be crack-free here, or shall we be defeated by indifference to good technology?

One of the really interesting post-war developments is the revival of the old stick-and-rag, or fibrous precast plaster technique, and its harnessing to the needs of modern design, both in conventional and prefabricated construction. The Herts schools were in the van here, using it from the outset as a major interior finish for walls and stanchions, where its trueness-to-shape has served them well. One of the spectacular examples in conventionally built buildings is the range of ceilings in the main auditorium and lower foyers of the Royal Festival Hall. But many uses, from light fittings to stanchion casings, are now being developed. Obviously we have here a very useful addition to our grammar which we can nourish to our advantage.

A relative of this last family of plaster products is the prefabricated partition unit, each face being made as a plaster casting, with a honeycomb plaster or plaster-covered core. These are in extensive manufacture and, of course, serve a very useful purpose, for they give a very finely finished surface, are easily handled and cut, and services can be inserted very readily. Units from some factories have shown a tendency to be delivered warped, and this has to be watched. Sound insulation is not too good.

In the same vein are the plasterboard partition units, with two boards joined by a treated cardboard egg-crating. These are astonishingly strong, and could even be used for light roofing. Perhaps if they were made with tapered plasterboard they would be even more useful.

The prefabricated plaster ceiling is being actively explored. Two types at least have been produced already, vermiculite plaster panels, and a gypsum panel perforated to let sound reach an incorporated absorbent. Multi-storey prefabricated buildings call for the development of cheap, prefabricated ceilings, sound absorbent, simple to fix, and offering adequate fire resistance. Plaster is the obvious product to exploit, and with any luck this problem should be resolved before very long.

Surface Finishes

The field of surface finishes is where most of the contemporary innovation in materials is to be found, partly because for the newcomer it is easier to enter profitably on a small scale than the field of basic products, partly because of the rapacious demands for novelty in decoration, and partly because modern technology seems to have opened the door to hopes of solving age-old technically difficult problems at less cost than former solutions. The range of novelty is now such that we cannot more than barely introduce ideas for discussion.

Some surfacing materials which spring to mind are being developed mainly with a view to use as claddings. The



Timber beams and stanchions, Herts schools

Materials and Techniques

authors have chosen to discuss these later in the section on claddings in the part of the paper devoted to techniques.

Paints

The paint world is changing. Linseed oil-based paints are substantially dying, being replaced either by linseed oil modified by resins, or by wholly resin-based types. As a class of product they tend to be more sensitive to poor workmanship than the older types of paint, but the finishes, especially the glosses, are so good that the trend is unlikely to be reversed. Troubles which do arise probably spring in the main from inadequate preparation of backgrounds, or other similarly suitable conditions. Unfortunately the contractor who knows the need for good preparations and includes for them in his estimating is likely to price himself out of jobs unless we look after this side of specification carefully.

The most obvious exception to this generalization is the growing use of p.v. acetate emulsions in place of flat distempers, for these emulsions are rather less "touchy" than the things they replace.

Methods of application are changing, too, of course. The outstanding innovation is the roller brush, both of the long- and short-pile varieties. Since these produce different kinds of finish, it seems we must learn which we want, and deliberately specify. Also we must note that in respect of practice the short-pile roller (e.g., mohair) tends to work paint more vigorously into a surface, while the long-pile (e.g., lambs' wool) is especially useful for rough surfaces. The real point is that they are not despised home-handicraft substitutes for long-hair brushes, but genuinely useful new tools. Incidentally, they do really appear to save time; figures as high as 25 per cent and higher, up to 40 per cent, have been mentioned.

One point which the general commentator can fairly note is that too much design with sharp edges is asked to rely upon paint for protection. Windows (both wood and metal) are obvious examples. The fact is that wet paint tends to pull away from a sharp arris, and failure therefore tends to begin here.

Cement glazes as a class include quite a variety of products. They are very hard, durable finishes, probably most fairly regarded as an alternative to tiling rather than to paint. They are commonly done by specialist firms who carry out the work with great care, but as so often this then tends to become a quality product only with a quality price. They make very good surfaces where standards of hygiene demand easily washed finishes capable of being kept clean in contaminating conditions. It seems a fair criticism of the work of some firms at least that they offer rather decidedly unpleasant colours and textures, and there is apparently and curiously a reluctance to provide plain colours and smooth finishes. Perhaps they expect cracking of the backing and have learnt that their speckled finishes are good disguises.

Architects have occasionally used chlorinated rubber based paints; it would be interesting to hear what the results are like, especially where it has been used on asbestos cement, for instance, for roofs.

Glazed Tiles

Architects have been enjoying a mild but not entirely untroubled flirtation with glazed tiles used externally during the past few years. The range of colours is, of course, exciting and very tempting both for internal and external use.

Internally there is no particular difficulty that we know of except the tendency of tile-makers to let colouring be inconsistent. For some purposes we must have consistant colours, and since Americans seem to be able to get them in tiles, we should set our sights high lest we be defeated not by inherent difficulties but merely by poor technology.

Outdoors we have more of a problem, with all the usual natural forces, moisture and solar heat especially, working against us. In one building examined by the research station the light-coloured tiles stayed on, but quite a few dark ones fell off. Some came away from the tile mortar, some came with it, but without the backing, and some came with the backing and all, leaving only the solid concrete. The fact that they were dark seems to be the key to the problem, suggesting thermal stress as the starting point for trouble; the curious thing is that it should have caused failure in no less than three ways. It is in cases of this kind that we must consider whether we are asking an impractically high standard of technology, or if the industry is giving too low a standard.

Floorings

The world of floorings is in a state of flux. Softwood is freely available once again, so that the struggle between it and thermoplastic tiles for the honour of the best low-cost house floor is on; purchase tax has been extended from the sheet forms of materials such as lino to the tile forms; the floor specialist trades are changing, and new industries are entering the market in a big way.

So far as the struggle between softwood and thermoplastic tiles is concerned, it is difficult to say where the balance will come to rest. No doubt wood on suspended joists will have its protagonists, but complaint about its quality and proneness to leak cold air was widespread before the war, and we have had a great many reminders that the solid floor has its own merits, among which are the facts that it will not leak cold air, and that it is finished when it is laid and throws no secondary finishing cost on the householder. We can let the struggle proceed while we keep an eye on the quality of what we are asked to use.

An unhappy feature of purchase tax is its ability to influence design indirectly and arbitrarily. Most of us have watched, thoughtfully, as large rolls of lino or rubber bearing purchase tax were cut up into squares which were then tax free. The extension of the tax to tile forms smooths this out, but leaves the balance between these and other materials artificially fixed. One can only hope that the need for these controls can some day disappear—if only to let us see what the natural state of affairs would then be.

As an aside to the use of tile and parquet forms of flooring, have many people tried running the grain all in one direction instead of alternating it parquet-wise? A few examples seen suggest it has an unexpectedly fine appearance.

"Big business" has contributed a new flooring, p.v.c. plastic, in both cut and sheet form. It is in its infancy and there are teething troubles which include some problems of adhesives; but it is a durable, very promising material, now well-established in the U.S.A.

On the face of it, rubber may seem to be pricing itself somewhat out of its pre-war place in the market, but one cannot pass it by without commenting on the embossed form of tile which the Ministry of Education architects developed and introduced at Wokingham. This has slightly raised buttons to give a firm grip and a constant appearance of cleanliness. Some of us who saw early samples and noted them with only mild interest were startled by its genuine loveliness at Wokingham, for added to the merits claimed for it was an unexpectedly good sense of soft texture on the big scale. Embossing is not a technique applicable to lino, which is calendared in manufacture, but presumably the p.v.c. makers could use it, and we might earnestly commend it to their attention.

The last development which we feel compelled to include is the Scandinavian introduction of thin hard woods, in small shapes (to reduce waste) fixed to low-grade backings and put down more or less in sheet forms. This kind of approach is often essential to sensible timber usage if one is to keep in balance with the natural ratio of high- to low-grade bulk timber growth, the low-grade being much the larger proportion. The floorings themselves are very presentable, well-behaved and competitive in cost, class for class.

One general observation to note is the post-war growth of the specialist flooring firms who will lay not just one type, as was most often the case before the war, but a range of types. This is a healthy growth. A firm which limits itself to one type is often tempted to use it in unsuitable places, just to keep trade going. When it can offer several, there is much less tendency for this to happen, and it helps to simplify the organization of the industry.

All this is in the right direction, but it must be admitted that too much of the movement forward in the flooring field is in the wake of American development, and while this is so we cannot take an easy view of how well we are served.

Sound Absorbents

The reluctance of architects and their clients to use sound absorbents extensively is one of the mysteries of modern building in this country, though there are signs of more activity now. It is difficult to say whether it is due to the high price of some of the absorbents which ought to be popular, or whether the high price is due to the limited market. Perhaps architects are just not attracted by some of the standard materials, and certainly it is odd that the one material most in evidence in the U.S.A. does not appear to be available here at all. This is a travertine-like tile, generally 12in square and made of plaster. Most often it is used as a suspended ceiling, the material being grooved accurately along the edges to fit on to a lightweight inverted "T" framing. The result is a ceiling so perfectly jointed that many people think it is ground off in situ. It has a highly acceptable texture.

The remarkable thing about ceilings in the U.S.A. these days is the almost complete absence of ordinary flat ceilings plastered in situ. Sound absorbent systems, usually in 12in squares, have almost universally taken their place, except in domestic buildings. In a two-month visit to the U.S.A. one of the authors saw no flat plastered ceiling except in a house or flat. The suspended acoustic ceiling has a great deal to commend it; most of the services are hidden above it, and part or all of the lighting is housed here. High plastering costs may be a factor in the American trend.

With some difficulty we have introduced perforated hardboards, plasterboards, and so on, which originated in Scandinavia, for use as absorbents here, but one would judge off-hand that their biggest sale is for decoration in show cases and displays. As a material the uniform array of holes is often boring or even distressing viewed at close range. The Scandinavians long since introduced better patterns, especially with slots, but there seems no initiative in getting these into the British market.

It is unquestionably a fact that the industry is not particularly enterprising in respect of design and development here; what is in more doubt is whether prices are really unreasonable for the size of the market, and, if so, whether it is because of unenterprising architects who won't specify, or a lack of interest in a popular market by the suppliers. But we should get these things moving; far too many rooms are spoilt by lack of absorbents.

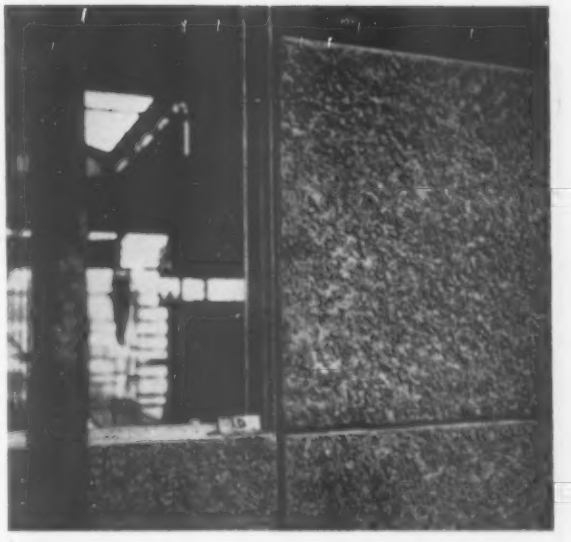
There are illogicalities to be seen in the arrangement of this discussion, for instance, floorings and sound absorbents have been treated as surface finishes, while ceilings and partitions were discussed under the heading "plaster." It cannot be helped, for it seemed the only sensible way to tie things together without repetition.

We are conscious of so many omissions in the list of newer materials, and even among the old there is no mention of timber, which comes later under "techniques." We must look to the Conference to bring into the picture anything which seems significant but which has received no mention.

PART III. TECHNIQUES

Turning now to discuss techniques, we find ourselves in a quickening world, not yet so lively and buoyant in innovation as we hope to see it, but moving forward decidedly in a way which promises well.

Does this note of optimism seem unwarranted? Perhaps it is a little surprising; but then so many of us may have a reason to be surprised. There were, for instance, all those who felt sure, perhaps a trifle cynically, that all would be as it was after the first world war, with a return to "normalcy" as soon as the need for "substitutes" disappeared. They are surely wrong this time. Then there were the legions among us who saw a vision of new materials and techniques in a bravely technical post-war world; by about 1948 this began to seem like a mirage, for there was not much of the brave new building world to be seen, and some of this discouragement has persisted. And, of course, there are the honoured amongst us who put their heart and soul into breaking the new problems properly, studying the background and creating the foreground, knowing that changes generally do not happen spontaneously but take time and hard work. If they are surprised at our feeling of optimism, perhaps they are too near the battle to see how well it is going.



Wall cladding at Wokingham school

The fact is that a real revolution in building is under way this time, partly due to architects, partly to the industry's new interest in better management and organization, partly due to research and partly to the growing *rapport* between all three. It is gathering momentum and will not stop now.

In what follows, we have made only one broad division, which is between the external skins, i.e., the claddings—and general constructional systems.

Claddings

We are discussing claddings first because in this division we are to some extent merely resuming our discussion of surface finishes, the border line between the two being indistinct in many places.

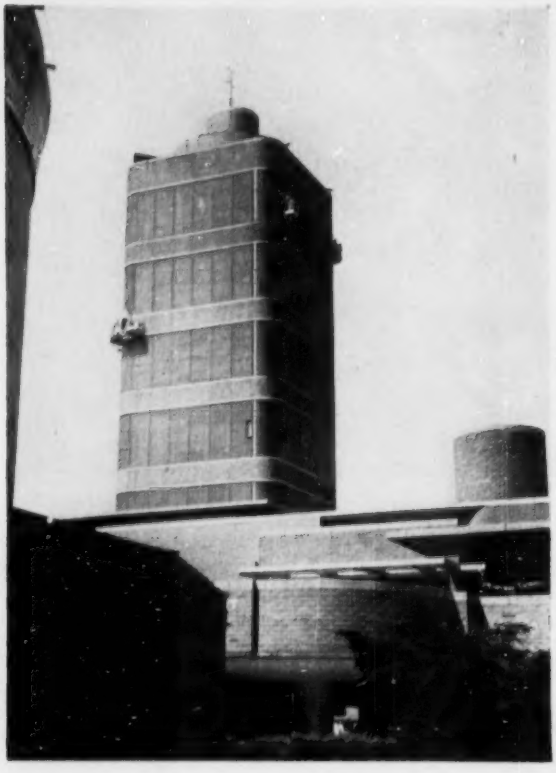
The term "claddings" is, of course, so wide that it can be used to embrace all outer wallings and roofings, but by common consent it appears now to mean generally the kinds of outer skins which are prefabricated in some degree or are very light in construction. It includes the simple skins which cover the frames of shed-type buildings, and curtain walls, and panel infillings, and lightweight roofing systems.

The problem of the day in cladding is to find tough, inexpensive, durable colourful, sheet materials. Some of the attempts are very interesting. There is, for instance, the fibreglass reinforced plastic sheet which is translucent and very tough. It is still new and not yet fully appraised. It might have a considerable contribution to make to factory construction, for its toughness and translucency both have merits for factories which are not yet possessed by asbestos cement, for instance, and presumably it will resist corrosion quite well.

Aluminium is, of course, already in this field and most of its properties are too well known to need attention here. It is most familiar in the form of corrugated sheeting of some kind, but in America it is being pressed as panels (about $\frac{1}{8}$in thick) for curtain walling. Naturally enough it was used on the Alcoa Building in Pittsburgh, and lately Emery Roth has used it on a new office building in New York.

The problem of a finish for aluminium is perhaps the outstanding difficulty. The pressed panels just mentioned were finished by a technique similar to our anodizing, giving a matt surface, generally greyish. Apparently the Alcoa Company maintain that anodizing can give a range of colours permanent for exterior use, but whether this will

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Johnson Tower. Frank Lloyd Wright

prove so in practice is perhaps not so relevant at the moment as the high cost of the treatment. The aluminium schools in this country have generally been finished by painting with a special treatment.

The fact that a good range of permanent colours is not yet in sight for any of the established sheet materials forces one to look at vitreous enamelling. As it has been produced thus far in Britain it is expensive and to some extent fragile. Now the prospect is brightening, because at least one firm has developed a technique of putting on to metal a single coating not unlike a vitreous material in its general character and durability, and at a relatively moderate price. The sheet is dipped and fired so that both sides are coated and finished simultaneously. The coating is said to fuse into the metal surface, and appears to be very tough as well as resistant to corrosion. In fact it seems likely to make sheet steel a long-life, moderate-cost, low-maintenance material for the first time. If prices, production and range of colours come out as anticipated, we may have here one of the materials for which we have been searching for a long time. It would have numerous uses, of course, as corrugated sheet and as panelling material for curtain walls, and no doubt in many other places where permanent colour is wanted outside. For example, a decidedly exciting sort of factory suddenly springs into vision, clad in these gay, washable colours, both inside and out.

Asbestos cement has a traditionally strong place in this market of claddings. It is cheap, easily moulded, resists corrosion, and can be formed in large sizes. One would say that basically it ought to meet a large number of architectural needs. Unfortunately it is brittle in some forms, and at present its only colour is apparently a whitish or middle-grey. No particular attempt has been evident on the industry's part to overcome these disadvantages, especially of colour, or to seek improvements in the shapes and other architectural qualities of asbestos cement, or even to meet the reasonable desires of architects to take advantage of the mouldability of the material in the way of special shapes. In fact, architects complain of a "take it or leave it" attitude on the part of the industry. What can we do as architects to stimulate industry to explore more adequately the possibilities of this material?

Of plastics there is very little new to say. We know they are expensive in large sheet forms, and that the only considerable use they have found is in such buildings as the schools in Herts and Kent, where ingenuity and the strictest economy in fixing methods was able to compensate sufficiently for other costs to bring the material into the picture. Its weathering properties seem not to be too bad after five-years' experience, but one wonders why the gloss finish is so assiduously sought by makers, when matt finishes would so often seem to be preferred by architects.

Glass, though as old as the hills, still needs a mention in this context. For one thing, it is now relatively very cheap, having gone up far less than other materials since the war, and therefore it makes the curtain wall of glass a more attractive economic prospect than it formerly was. We will come back to this later.

As for new types of glass, perhaps the main developments have been the increasing use of anti-sun glass in the U.S.A., the development of double glazing, and—on the horizon—stove-enamelled glass.

This greenish anti-sun glass which Americans use extensively to reduce solar heat gain and sky-glare is an interesting development, more familiar here on recent American motor cars than in buildings. It gives a curiously aquarium-like appearance to glass-faced buildings such as the Lever Building as seen from the outside, but is unquestionably a great comfort to occupants. Architecturally it calls urgently for some pure colours outside to offset the uniform greenishness, for despite all the talk about sky reflections and so on, a street of Lever buildings would be very monotonous. It is perhaps doubtful if the glass will find extensive use here; it is expensive, and the need is not so very great unless one is using cooling plant, in which case it helps to reduce cooling load and therefore plant costs. British architects may find themselves using it abroad, and then they should acquaint themselves thoroughly with its tricks.

Double glazing is only slowly and painfully finding a place in our work. The twin-pane proprietary systems are generally satisfactory and fool-proof, but their costs tempt architects to seek non-proprietary ways of double glazing, usually either by a separate parasite frame carried by the main frame or by leaving one pane removable, for instance by fixing with screwed glazing beads. Experience of these has not yet been collected, but there have been some successes and no doubt some failures. Removal for cleaning every few years—perhaps at three- or four-year intervals—seems likely to be necessary with any system not absolutely sealed.

Stove-enamelled glass is apparently being considered for production, and this would obviously be a valuable addition to the terribly small range of permanently coloured, colourful claddings. One of the twin-pane producers now markets a sandwich with a paint coat, reinforced by glass fibre, on an inner surface, and in the sheltered conditions of the air-tight cavity, with carefully chosen paints and pigments, it seems possible that it will last very well. This sort of development makes one wish to be able to foretell the future; but artificial weathering tests would be an acceptable substitute.

And finally timber, for this is beginning to play a considerable part in claddings, especially on low buildings where its beauty can be registered at close range. African hardwoods and western red cedar and several other woods are now being used extensively on school buildings, generally in vertical strip arrangements, and appear to be in the right cost range, though some seem dearer than they ought to be.

This seems to cover the main groups of materials serving as outer skins in cladding systems, though no doubt it omits

[Continued on page 615

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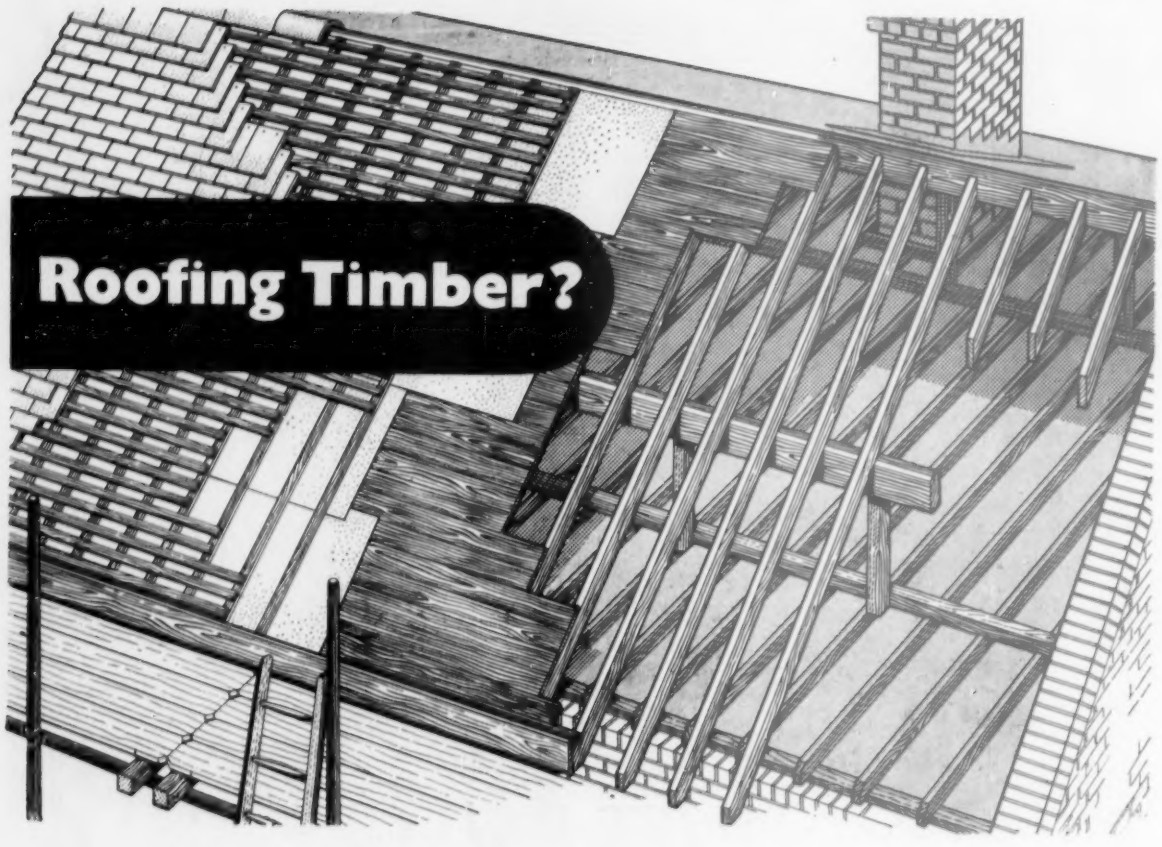
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Stone cladding, Southlands Training College

Continued from page 614

a great many individually interesting products. Now we must move on to consider what holds such materials in place.

Curtain walling systems have been introduced by several British firms lately, and at the present rate of development we should be quite nicely served in two or three years' time. One system uses deep, thin box mullions and transoms of aluminium, organized to receive glass direct or in opening lights, or thick composite panels. This frame is simply bolted to the main structure. Then there is a system of patent glazing bars used both as horizontals and verticals, organized to carry glass as the weatherproof skin, with panel infillings for colour and thermal insulation supported on the back side. The former system is just now coming into use and the latter has been used on a number of jobs already. A third system, in galvanized steel flats, with aluminium capping sections, forms a very adaptable grid capable of taking glazing and panel infillings of various kinds, and this is again just coming into use here, though it seems at least one job was done with it in the U.S.A. some time ago.

The development of these metal proprietary systems makes one ask if wood is not practicable. The answer is seen in the very nice example of softwood timber framing at Harvard University which is shown on page 610. It is nothing more nor less than a very large window with clear and coloured glass fixed directly into it. On examination by one of the authors no leakage or other trouble could be detected. The relative costs will be worth examining.

Americans have special experience of curtain walls for high buildings which we do not yet possess. Presumably it is something we will have to acquire in connection with some of the new office buildings now being planned over here. Their external coverings for mullions are generally aluminium or stainless steel and their main cladding skins are glass or pressed aluminium.

The United Nations Building was the test ground for modern American curtain walling, and its designers took a courageous, tremendous stride in design, which has unfortunately suffered some difficulties which we must all hope are now overcome.

The building stands, of course, very exposed to high winds and driving rains, and the skin being entirely of glass and unabsorbent, the conditions are specially severe—though no more severe than any building here should have to stand. The factor which seems to have been unexpected is that some of the air forced against the building travels or is sucked upward, carrying with it water which enters into various weep holes, drips, etc., designed for drainage on the normal assumption of downward flow. It has been necessary to carry out extensive remedial measures to seal vulnerable points and joints, which it is now hoped have cured the troubles. It remains the case, however, that in these high, exposed structures we must apparently face the need for virtually completely weather-tight construction if we are going to use non-absorbent curtain walls. It is the difference in absorption between this and conventional materials which creates the special difficulties.

In this connection one is then bound to ask whether our mastics and putties are going to meet the demands made upon them. Certainly they are likely to prove vulnerable unless protected. Mr. Lloyd Wright's brave use of glass tubes on the Johnson Building has demonstrated this. But even protected by beadings and cover strips it seems we must view our dependence on it with a very cautious eye.

Apart from the tendency of the material to harden, there is the particular problem that it is supposed to adhere to things in constant relative movement. Glass, when it gets warm and cold expands and contracts. If it is clear glass the movement is small, because the temperature change is not so great. But we now ask for coloured anti-sun glass, or glass coloured to give colourful panels, and we locate thermal insulation behind, and all these increase the temperature range in the glass and consequently the amount of movement. We know this is so because one of the difficulties we are facing here to-day (and this happened in the Lever Building, too) is that such glass panels require exceptional glazing tolerances, and unless these are meticulously observed, the result is cracked glass. It seems then optimistic beyond reason to expect putties to adhere in a watertight way when such movements are going on, and to continue to adhere for, say, 15, 20 or 30 years.

Curiously enough, Americans do not have the equivalent of our patent glazing bar, in which one relies on drainage rather than putty, but this seems obviously the more promising solution. Can we, in fact, be shown some putty that is plastic after, say, 10 years?

One logical precaution to take, and one which is desirable on other grounds, is to provide a cleaning gantry, along the lines of the one on the Lever Building. It greatly simplifies cleaning, and it also makes the building face accessible for repairs. It should be a standard provision; but an interesting problem arises; on a high building, should it not be tracked down the face of the building? Would one like to have a cradle at the end of 200ft of rope without some arrangement to steady it?

The most difficult problems arise in connection with the spandrel panels rather than with the clear glass. Early in this paper we spoke of condensation and thermal insulation, and described how these two interplay. Numerous attempts are being made to-day to produce sandwich panels for spandrels which combine thermal insulation, fire resistance, a colour face, and an impervious outer skin, often of glass, without being prone to condensation troubles. Saarinen at the General Motors Technical Centre brought into being very elegant panels with stove-enamelled facings inside and out and a thermal insulating core, and other solutions are coming forward both in the U.S.A. and here.

They have the special difficulty that not only must they keep water out of the building, but out of the core or backing also, which is generally awkward to waterproof at the edge cheaply. Some of Saarinen's panels suffered a misfortune in this way, for the cores got saturated. It is at least open to question whether it is not better to dissociate the weather skin from the thermal insulation by mounting

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the latter separately behind. It seems almost certain to be so, as a general principle of design.

Saarinen has introduced another new approach by using an extruded rubber section to connect the mullions and the panels. This is a well-established motor car technique, and there it certainly stands up surprisingly well; but the life of a car and a building are so different that one hesitates to argue from one to the other in the case of a material of this kind, for a purpose as vital as this. Can rubber in sunlight be expected to last more than ten years?

We have no more than mentioned fire up to now but it often is a major factor in curtain walling, especially in urban areas where one major purpose of fire codes is to prevent the spread of fire, both by containing it in the source building and by excluding it from neighbouring buildings. Generally speaking, the proportion of window on the façade of a building has been restricted, and the remaining areas have to meet requirements for incombustibility (a limitation on the risk of flame-spread) and a fire-resistance standard of one or two or more hours.

No doubt these requirements not only serve their intended purpose fairly well, but mitigate danger and unpleasantness in fire-fighting. Nevertheless, they can still be needlessly restrictive. This greatly hampers development, and when innovating, the only way to tackle this is to get a thorough grasp of the technology and insist on going to the root of the requirement and getting a decision based then on sound reasoning from first principles.

For example, one may find byelaws framed for urban buildings in relatively narrow streets applied to buildings facing open squares, or applied to flats on estates where there is adequate space between buildings to make fire spread nearly impossible. This is the time to really begin an argument.

One is always tempted to think that if a wall is perforated by windows anyway it might as well be entirely window or without fire resistance, for all the good that fire resistance will do on the remainder of the wall. That is a problem that many of us have to face, but it can be successfully dealt with and though we cannot go into it in detail, the new Scottish byelaws have covered it in a most adequate manner by including a clause covering buildings that are deemed not to have an external wall.

Looking back on this discussion of claddings, and recollecting also the remarks about condensation at the beginning of the paper, we can see that curtain walling is technically difficult. We have to use watertight materials instead of absorbent ones, and then we bring ourselves up against formidable jointing difficulties. We ask for durable, tough, coloured surfaces. We want some thermal insulation and we cannot afford to have condensation. We are obliged to provide some fire resistance; and we are not allowed to forget that conventional cavity walls cost only about 5s per ft super.

One is almost inclined to ask why it is worth trying. A goodly part of the answer lies in the fact that it seems a logical architectural device, and if it seems so, then we must simply settle down to work it out properly. If the economics look difficult let us recall some compensations: light things are cheaper to lift than heavy ones, and lifting things is quite an item in buildings costs; lightness and prefabrication can mean quickness (the aluminium cladding on Roth's building in New York was placed in 6½ days) and speed is itself worth money; light walls also mean lighter supporting structures, sometimes for instance with the omission of perimeter beams; and finally lighter structures mean reduced foundation costs. In a matter such as building construction, where true costs per element are difficult or impossible to establish, and novelty has such illogical consequences, it is usually better to stick to the logic and have faith than to accept too readily a superficially discouraging picture.

At the same time we have something to learn about the handling of curtain walling in the purely design sense, for problems such as scale, pattern and texture will raise themselves quite formidably. For instance, one example seen of the glazing-bar curtain walling seemed to suggest that its smooth uniformity calls for big-scale modelling of the structure. On the other hand, the timber frame at Harvard, with its regular shadow-pattern, could obviously provide its own interest in detail without quite such a demand for major-scale interest. All this will play its part in development, thrust forward by the knowledge that brickwork in cities is slow, dark and dirt-collecting, and stone, which almost alone among traditional materials can give brightness, is expensive.

There is a special and important sector of the curtain-wall problem that is rapidly developing here in Britain. We have a great many cases in school construction, and an increasing number in flats, where we can use a prefabricated panel to fill in an entire bay of the frame, so that it forms the outer wall, but does not travel across the frame like a true curtain wall. In prefabrication systems it is an obviously sound approach. In conventionally built buildings it is probably equally sound, but perhaps is less obvious as an answer because there we have such a persistent tradition of brickwork walling.

The argument emerges most readily from the use of cross-wall construction. We will be saying more about this later, but we can take it here that it is economically attractive and can be made more so by getting rid of the need for foundations under the outer walls (only the cross-walls take loads). Thus one is confronted by the idea of avoiding weight in the outer wall by the use of panel inserts, and having got that far one discovers that it is possible to dispense with the perimeter beams too if the floors can take the light panels. Then one brings to bear the point about the reduced weight to be lifted, and the possibility of reducing or avoiding scaffolding, and the whole pattern begins to make sense. Add to this the freedom from institutional appearance you can achieve for purposes like flats, for instance, and it acquires great attractiveness.

Actually, the panels themselves can probably be cheaper than if they are whole curtain walls, but this partly depends on other factors, especially the use of balconies. The point about these is that they can somewhat mitigate the weathering problems, reduce the fire risk, and simplify access for maintenance. They reduce the fire risk by interposing an incombustible element between neighbouring panels, and whether this is in the plane of the wall or projecting is of less consequence than its mere presence. Probably it is more effective if it projects. In these circumstances it even becomes practicable to consider wood frames in place of metal, and possibly combustible facings, and certainly linings such as plaster-board, all of which help to make the cost competitive.

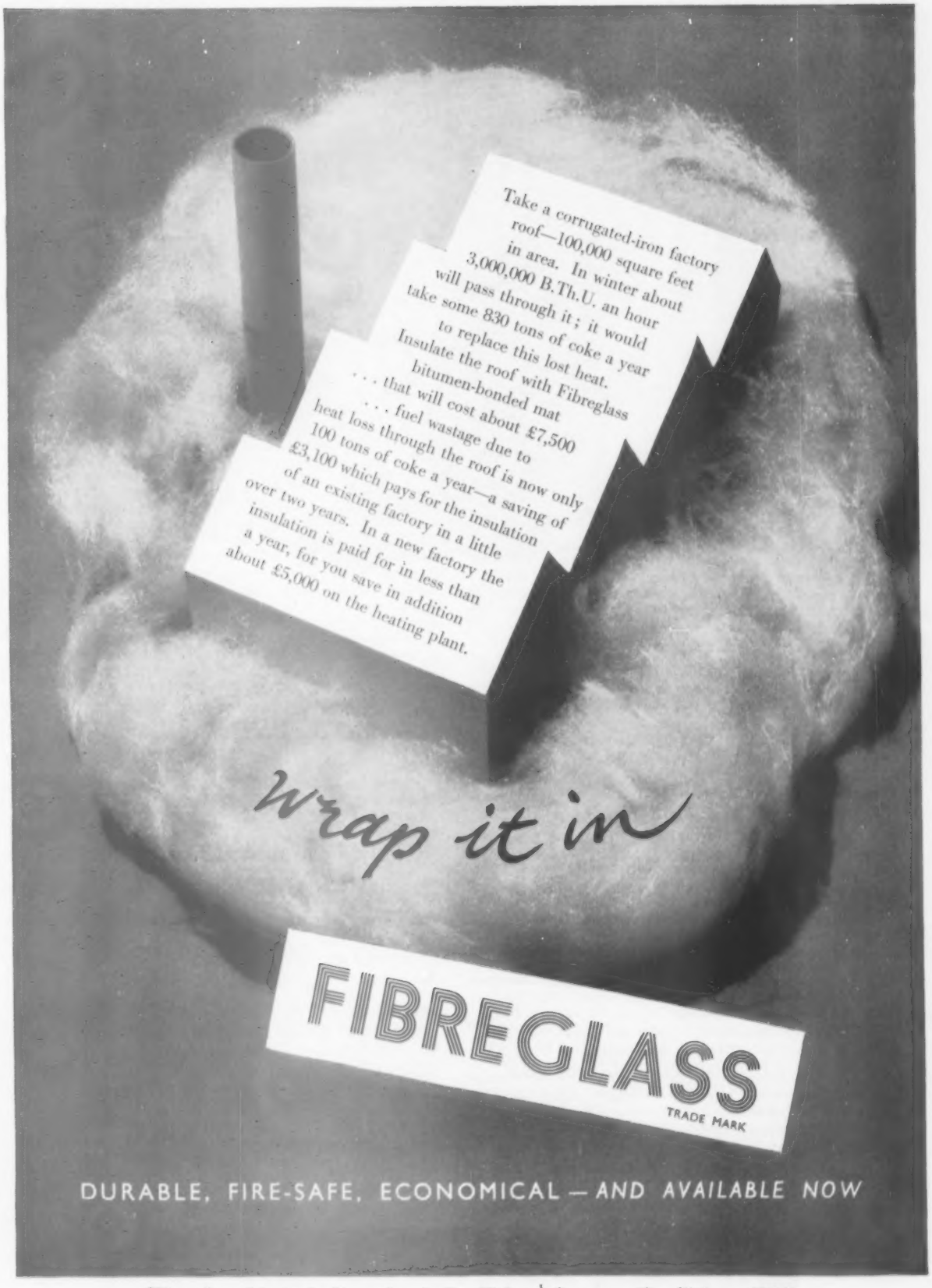
Although panels do not seem to have been used much for no-fines concrete buildings yet, the case is perhaps stronger here than anywhere. No-fines concrete is now being used here up to six storeys, and up to nearly 20 in Germany, so it is growing in importance, but the only finish that seems to be considered is rendering.

Now we have not discussed renderings in this paper and this was deliberate. They seem to us so often unsuited to

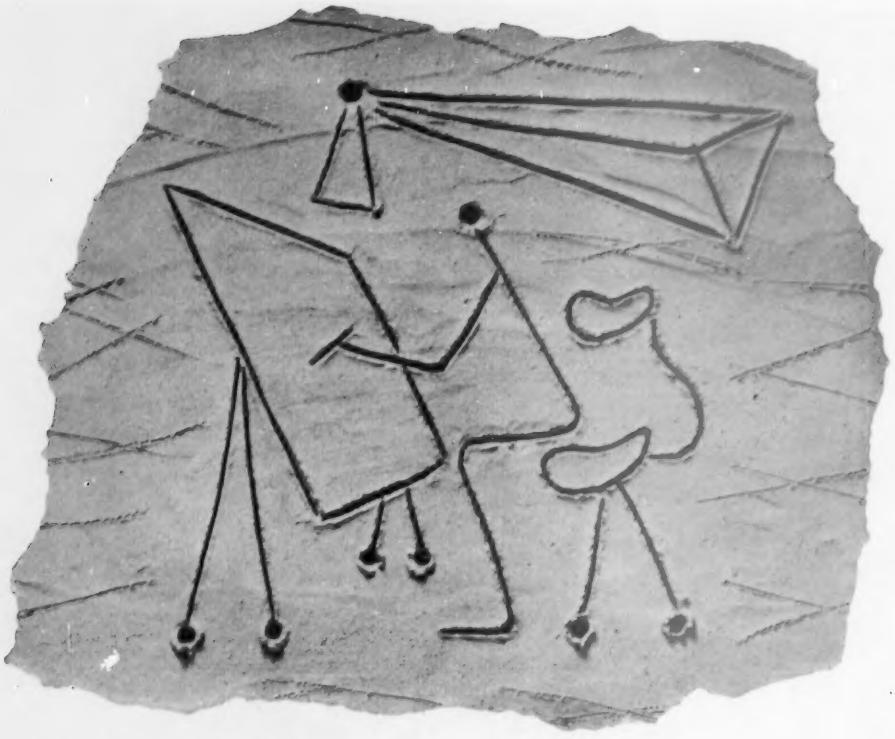
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the British climate, except perhaps for small domestic property. Our dirt is aggressively sticky and renderings, which tend to be dull to start with, seldom look anything but dirty and grim after a few years, even in rural areas. There is a high-grade continental type scraped rendering which has had 17 years' exposure at the Building Research Station (which is in a rural area), and it has not only lost much of its initially good appearance, but it would be difficult to recover. Others look almost as bad and often worse, and all of them are sensitive to disfigurement by cracking. It seems very reasonable therefore to consider seriously the extensive use of panel infillings with no-fines concrete.

We approach the end of this long subject of claddings with a passing mention of some heavier wall finishes, and one increasingly popular roof construction.

One struggling idea in the heavy cladding class is the surfacing of structural concrete or brickwork with thin sawn stone or precast concrete. Sometimes it works and sometimes not. There is certainly one common point to look out for—this question of absorption. Well-made concrete finishes can be relatively unabsorbent; joints, on the other hand, will often invite water to enter by capillary action through the cracks that usually form. The non-absorbent slab leaves plenty of water available for the joints to take up, and they draw it in to the interspace between slabs and structural wall where it may weep out through lower joints down the face of the building or find cracks through to the internal finish. We must remember once again that the impermeable unit demands the perfect joint, and the latter is harder to obtain than the former. There is much to be said then for the rather absorbent stone face; it reduces the free water left to attack the joints, and makes the points themselves safer by absorption along them.

This is not to decry the excellent development of concrete surface finishes since the war. The Cement and Concrete Association and to some extent the Building Research Station and several individual enterprises have pushed this work forward actively and we now have an industry able to turn out good quality highly attractive precast concrete units at competitive prices. Partly this has been due to the developers of systems for schools, who have made extensive use of stone aggregate finishes on slabs. We seem now at long last to be moving out of the era of the artificial stones which were so prone to crazing. We are not entirely out yet, however.

In the precasting field some of the effort has been put into developing slabs combining concrete faces with insulated backings of wood wool or a special concrete ready to receive a finish nailed in place. These mainly belong to proprietary prefabrication systems at present, but obviously the idea has more general uses providing that the economics are right. Wokingham and Coventry (Broad Lane) Schools have them.

* * *

We mentioned in our discussion of clays the fact that pulverized fuel ash and clay combinations might make possible relatively large flat clay sheets, and these, if they can be produced, would seem to have a very useful place as spandrel panels. Presumably they could be colourful and relatively cheap, and certainly they would have the toughness, fire resistance, durability and other properties of the "perfect" cladding, excepting only that they are heavy. But they need not be so very heavy, and some constructions will be able to carry the weight without embarrassment.

* * *

The only new roofing system which seems to fall within the accepted idea of a cladding, which is not part of a proprietary system, is based on the use of wood-wool slabs. It is not really "new," of course, but it is so in the sense that it has steadily gained ground since the war. There are good reasons. It is basically competitive in cost, has sufficient strength to do reasonable spans, offers thermal insulation and sound absorption at the same time, can be cut and chased readily, makes a good plaster-base, and so on. As a rule it is covered with a screed of from ½in to 1½in as a base for a bitumen felt roof or asphalt.

The one point which has to be watched for—and this is not a point about wood-wool roofs alone but about all roofs incorporating good thermal insulation—is that if solar heat absorbed by the roof is not able to be dissipated into the building, the screed and waterproofing tend to get exceptionally hot, for roof temperatures can reach 140° F or more in summer sunshine here, and far more than this abroad. Moisture and moist air are almost always with us in British buildings, and will be present in the wood-wool, in the screed and between the layers of felt when these are fixed in place. The effect of heat upon any trapped body of air is to raise both air and vapour pressures so that felts tend to lift, blister and de-laminate, often in long ridges which the Americans call "crocodiling." The combined air and vapour pressures are surprisingly high, of the order of two, three or more lb/sq in, so you will see they are not to be lightly dismissed.

This is a reminder that we should keep roofs cool, and the greater the thermal insulation below the waterproofing, the greater the need to reflect solar heat. We have said a trifle about this already, but it gives us a particular reason for saying here that what we want and urgently need from the roofing felt trade are felts with really pale-coloured and white grit finishes. The fact is that far too many roofing felts seem to be giving trouble, and although their darkness is not likely to be the only cause, it can hardly fail to be quite a contributor. Bad workmanship can, of course, introduce trouble, too, but this is a separate issue; let us get the felts first. * * *

Thus we come to the end of our discussion on claddings, with a fresh realization of the major part they play in our picture of building technique, and an impression of the formidable technology which has to be incorporated in them to put us in command of the exteriors of our buildings.

Whole Systems of Construction

So much capital is involved in building whole structures that one would not expect many new techniques to be evolved, but the profession and the industry are—relatively speaking—coming alive with ideas, and a surprising number are finding places for themselves. In what follows we discuss site fabrication methods and prefabrication together. It is an increasingly illogical to separate them, for the two are blending rapidly.

We will begin with something which in itself is not very exciting architecturally, but concerns large numbers of us, and that is the use of conventional load-bearing construction beyond what has usually been taken to be its limits. At its simplest this is merely the thrusting upward of cavity walling to three, perhaps four, storeys. It is being done here now, but some of the work that one sees vigorously emphasizes the increasing need for good workmanship as one puts more than normal house loads on to the construction. In Germany and no doubt elsewhere on the Continent they are going four storeys and more in cavity rubble-concrete block construction about the same thickness as our 11in work, but you find them using a better grade of block in the lower storeys, and a good class of workmanship everywhere, and a fairly general use of concrete floors which help to stabilize the structure. In fact, you move out of the "traditional" approach into the engineering field as you extend the use of simple cavity construction. However, the fact that it all lies within the familiar domestic range of materials and methods suggests that it is likely to be reasonable in cost.

More interesting are some of the modern uses of improved single-thickness brickwork in France, Switzerland and other Continental countries. On one French example the bricks are large, 25 cm × 25 cm × 12 cm (i.e., about 9in × 9in × 4in), perforated in such a way as to make long paths for heat transmission (i.e., better heat insulation), and provided with a pair of thumb holes for lifting. The perforations run vertically, and the brickwork is mortared by machine in three strips (central and along each edge), with two strips up the ends. With this construction they are going up seven storeys, and if they make lower storeys with 35 cm walls, they are going up to nine storeys. This, in turn, is more than matched in Switzerland—in Basle—where 13-storey blocks have been erected with 38 cm thicknesses. And, in a way, even this is outstripped again in Germany and in Sweden, where 9in walls of light-weight blocks carry 9-storey buildings.

The fact is that Continental brick and block makers seem often to have more modern plant and laboratories and

Materials and Techniques

modern ideas, and to be more alive to the need to thrust forward and explore the extended use of their products; can we honestly say we can see the counterpart here? Parts of the industry are very efficient, but this is not enough.

Turning now to framed structures, a first, though relatively mundane matter, is to look at the common steel and reinforced concrete frames, for steel is now back again and the question is which of these two is likely to be our mainstay? On the whole, the advantage seems to lie with steel; concrete is slow, the shuttering tends to be expensive, and reinforcing has a heavy labour charge, though prefabrication of it may reduce this. The fact that steel is in fact part-prefabricated gives it a head-start which concrete seems unlikely to be able to overtake.

Having got this far, in comparing two such common materials, one is tempted to go further and ask if we have always to cover up the steel. Most of us will have noticed with a good deal of interest Mies van der Rohe's work in Illinois, where he coats his steel with a special bituminous compound supplied to a specification by the American naval authorities and does interesting things with brickwork. One of the authors examined it recently, and was very favourably impressed indeed by the freedom from trouble and high quality of workmanship, for there seemed nothing to choose as regards apparent age between the newest and oldest buildings.

The technology and preparatory work put into this development was and is of a very high order, of course, and needs to be for this manner of design. One wonders whether attempts now being made to do something very much like it over here will work out quite so well. Can it be afforded? Can our levels of technology meet the demands? Will something designed for Chicago's climate stand up to our exacting conditions? And we must remember, so far as bituminous compounds go, that the one thing that breaks them down quickly is sunlight. All these questions spring to mind as one's memory goes back to unhappy histories of architectural ideas imported as architecture rather than as technology.

Architecture is the child of its environment.

Concrete may not seem so promising for in situ framing, but in some other forms it has a strong position.

One approach was seen by recent architectural visitors to Russia who brought back illustrations of precast framing being used for apparently quite high structures, with the junctions being formed by welding together in situ some steel shoes cast in the ends of beams and stanchions. Presumably these were located truly and helped the erection of the frame. This may be a good line to pursue, but it seems somewhat cumbersome and inelegant and contributes nothing to design. It is just a frame, seemingly, with the disadvantage that a fair range of components is needed.

A more promising line is found in a recent German building in Cologne, for one of the Ministries. In this case exposed uprights between windows are high-quality precast concrete units of storey height, designed to take vertical loads but not connected to the floors in any way capable of transmitting moments. Instead, the floors are cast in situ and the moments resulting from wind forces are taken by the large panel walls formed at the end of the blocks and at other strategically chosen points in the plan. Spandrel panels fill in the spaces below the windows.

The whole conception is simple, and well suited for quick erection. It provides very satisfactory office accommodation and gives clean, rather elegant interiors and exteriors. Owing to the high quality of the precasting, they get away with no plastering in many places, and only need a skin coat in others. It is well worth consideration for wide use.

The prestressed concrete system newly developed as part of the Ministry of Education development programme begins to look as though it may grow into a fine and lusty member of our community of building types. It has been described in the press and therefore needs only the briefest of descriptions here. It is a fully prefabricated system, comprising prestressed stanchions of remarkably small section (e.g., 4in × 6in) considering they run through four storeys, and these carry a flooring system of constant depth precast units, post-stressed into beams capable of classroom spans, decked in concrete slabs, and with precast sound-absorbent plaster ceiling panels. The outer walls are clad in pre-cast concrete slabs with a crushed stone finish and hardwood windows are used.

Apparently the economics of this system are working out very well and are proving attractive to buyers. Like so many of the other prefabrication systems originating in the British schools world, this can be used for many purposes apart from educational buildings because of its quality, quickness, price and adaptability. The big spans they are organized to give contribute valuably to their adaptability, of course.

In Scandinavia and in one or two places elsewhere efforts have been made to develop precasting techniques for flats by providing whole walls, partitions and floors, fabricated in concrete in a site shop and erected by a gantry travelling over the whole building. The idea of the site shop is sound, for it generally pays in precasting any extensive run of units to have it done on the site rather than to transport finished units. But the gantry is an unwieldy, expensive item, and the idea itself seems to be architecturally rather unsatisfactory.

As a means of getting walls and floors in place, climbing shuttering for in situ work holds out basically much more prospect of success, and a trend in this direction seems bound to occur. Its essential advantage is that the three operations of striking, cleaning and re-erecting which are necessary at every lift with conventional shuttering are entirely cut out. These often make form work more expensive than the item being formed inside it. The main limitation of climbing shuttering is that the building must be identical in respect of main elements on each floor.

Buildings are being erected with this system in Hamburg. The shuttering is designed to climb up rods left in the centre of the concrete elements, and wall shutters are joined by decking which provides a working platform over the whole area and eventually is itself the formwork for the roof. The intermediate floors are formed subsequently on telescopic shuttering, held in holes left in the walls. It is a pity the platform cannot be lowered for this part of the job. The shutters climb on automatic hydraulic jacks working uniformly at a 4in rise per hour, and a little arithmetic will indicate that this represents a storey per 24-hr day.

Curiously enough shuttering of this general type was in use twenty years ago or more for silos, but the jacks were mechanical. One wonders at once why it was not developed here to the stage now reached in Germany. Plenty of time was available and the need was evident. Is it once again the lack of imagination at the development stage, which seems so often to hold us up?

* * *

Cross-wall (or box-frame) construction has been mentioned in the discussion on claddings. It is a strong contender for a place in our general construction practice because of its simplicity and economy, part of which is due to the limited foundationing required. It lends itself well to panel claddings, which lead to secondary economies, and might be a very good system to build by climbing shuttering. In some districts borough surveyors have insisted on foundations for outer walls regardless of logic; it destroys much of the economic advantage and should, of course, be contested.

The construction of flats in no-fines concrete is developing now in this country, which pioneered (north of the border) the idea of no-fines concretes. The basic economy comes from the reduced cost of material and from the fact that because it does not build up normal pressure in the formwork, you can cast at least two storeys at once, using only lightweight open mesh shuttering. The shutters are, of course, large and their arrangement has to be taken into account in design; and they are handled by crane. The usual finish is a rendering, but we discussed earlier the apparent advantages of lightweight claddings.

At Coventry and Birmingham they have used the technique up to four or six storeys, the non-fines walls in the

latter being supplemented by dense r.c. framing formed *in situ*. It is an interesting development but apparently has been much outdone in Germany where heights as great as 19 storeys have been built. The design there is well engineered, the concretes being graded to increase in strength towards the bottom storeys, and the plan being well organized so that plan elements introduce stiffening in particular ways and places to provide the necessary stability. The Germans have made extensive use of no-fines concrete to absorb their wartime rubble.

It will be seen that while it may very well be that steel is cheaper than concrete for ordinary frames, it is obvious that the versatility of concrete is going to keep it firmly in the picture for some time to come.

* * *

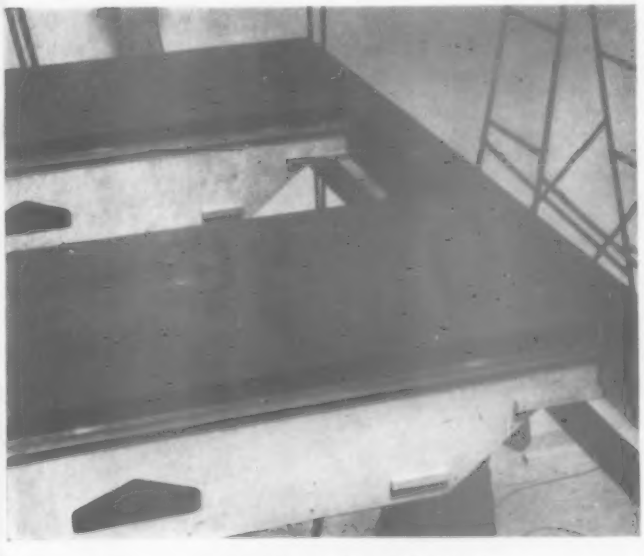
We ignored timber in Part II because as a material it is hardly changing, and anything to be said about it concerns techniques mainly.

The timber shortages of the past fifteen years have in a sense deprived us of a generation of experience in the refined engineering use of this material, though the shortages themselves gave rise to some interesting efforts to replace timber by ingenuity, reflected for instance in that remarkable plywood aircraft the "Mosquito." Now that timber is free from control here, the field is wide open for new enterprise in timber construction.

It does not seem that continental folk are really very much interested in timber engineering, but Americans definitely are, of course, and gave considerable attention during the war and afterwards to glued laminated arches and similar structures. The only good example of this that we recall on our side of the water is the Waterloo Station entrance built for the Festival of Britain in 1951. Some Americans have been seriously considering timber either in arch or lamella form for factories, on the assumption that full sprinklering will sufficiently take care of fire risks.

Here in Britain the one really outstanding timber development is for systems designed in the first instance for schools, and now being used, like other school systems, for other purposes. One of the interesting things about these is that they have been developed thus far mainly in terms of imported, rather expensive hardwoods, and even so they proved sharply competitive in costs. Now that the cheaper softwood is freely available again they are obviously in an even stronger position, cost-wise.

One of the first off the mark was the Derwent system, mainly of pre-formed panels, fixed between the simplest of uprights, carrying a stressed plywood beam system for the roof. The thing that stamps this job with a special quality, apart from its simplicity, is the use of a very elegant mahogany cladding in vertical strips. Originally designed as a single-storey system, it has been worked up now to a second floor.



Punt Roof System

Alongside this in a sense stands Hertfordshire's own system, using rather handsome, heavy timber V's as major stanchions, anti-phased in the modular grid, again carrying a stressed plywood major beam system with minor beams to supplement it. The external cladding is of vertical strip boarding and the whole looks very well. In fact the big V's give a special sense of architectural quality which is rather outside our experience in our prefabricated schools, at least so far as external appearance is concerned.

The Punt system is a timber arrangement in which the panels meet on the grid lines, and carry all the roof loads, the roof being of long box beams, or "punts" with stressed plywood sides. The assembly is commenced by accurately setting out a steel foundation jig, which then forms a permanent shutter for concrete and guides the setting out of all main-plan components. The walls and partitions are assembled complete with doors and windows, and a building of charm and quality is put together astonishingly quickly.

The difficulties of fire-proofing timber discourage its use for more than one or two storeys, but within this limitation it is crystal clear that prefabricated wood structures can carve a distinct niche for themselves in modern building in this country. It shows up the advantageous cost characteristics of timber used this way that the combination should be so competitive with other prefabrication here in Britain where all the structural timber has to be imported.

* * *

Notes about two or three isolated matters are needed here to round off our discussion on techniques of construction.

Floors have had a considerable amount of attention since the war without any very marked change of floor construction being caused. We cannot attempt a full review, but one ingenious new Scottish development may not yet have come to general notice. This is a system using thin prestressed concrete planks which are sprung upwards in the centre by strutting, and are then given a screed to take the compression stresses as it flattens on removing the supports. It is topped off with a flooring finish and is plastered beneath. Perhaps some such development will hold a place in building though this will depend on its costs which, on the face of it, seem likely to be a little high.

This suggests a remark about the lowering of floor costs generally. In principle the best hope of reaching minimum costs for floors appears to be by precasting so that finishing can be completed in one operation only above and one below. In a broad sense this should be true of construction generally; if you leave more than one operation to be done on site for finishing you have stopped short of what should be worthwhile; and if you apply the final finish off the site, you are asking for something in the way of carefulness on the site that the industry cannot easily give.

* * *

We cannot take time to discuss foundations in any detail here but there is a kind of thinking about them which we want to mention. It is the need to recognize that there is sometimes an interplay of sub- and super-structure which calls for an architectonic concept below ground if you are to get true economy and efficiency. One can catch the idea from an example.

No-fines concrete is not very strong in tension and it is best to have a building of this material on a very rigid foundation. Now the easiest and cheapest way to get rigidity is likely to be by making the basement as a reinforced concrete box system, but even so, if the plan form becomes large, the box has to be increased in depth to retain the desirable rigidity. This probably means increasing the number of storeys below ground to two, three or even more, and this loses its point in the end so that one sees the argument developing that with this kind of structure the right course is probably to limit the area and go up in height.

Other examples could be quoted, but this is sufficient to illustrate the point that we need information about types of foundation and types of soil of the kind which makes

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it possible for the architectural imagination to come to bear upon the whole structure, and not just the part that shows above ground. Things that go wrong below ground are not merely acts of God, and they are best avoided not merely by leaving the business to an engineer, but by seeing that sub- and super-structure are conceived in a good architectural relationship.

* * *

We have omitted from our paper any general discussion of mechanical plant because it concerns assembly rather than design. But there is one item we must bring in, the continental tower crane, unknown here until recently but now in rapidly widening use. A variety of types has been developed for all sorts of buildings, ranging from small ones for houses, through tall, long-reaching ones for quite big buildings, and self-climbing types for the tallest structures.

Both in the industry and the profession we have to learn how to use these to get the best value from them. The industry, for its part, must eventually not only be expected to have the right types but to know how to organize its labour in relation to them. On our side we have to think of at least three things—our plans in relation to crane movements and range the sequence of operations so that cranes can be fully utilized to lift everything liftable; and the striking of a good balance between the capacity of cranes and the weight of things to be lifted.

It is too early to expect these things to be crystallized into accepted practices; but it is not too early for us to be forcing the pace in this direction, for the opportunities of economy and efficiency lie first in our own hands, on the drawing board. This is true of all kinds of construction, but it is especially true of innovation because it can so easily become an economic liability rather than an asset if it is not easily buildable.

* * *

In flats to-day one touch-point of economy is through the use of shunt flues for the chimney system. The aerodynamics of shunt-flue chimney systems is a field where much remains to be learnt, but there are a great number of continental installations operating to-day which give us a good spring-board. Unfortunately it appears that most of them are connected to continental closed stoves, and the few that operate with open fires do so in centrally heated buildings, where the central heating assures the warm flue needed for draught. The next stage which we should try to determine is to see how it works with open fires but without central heating, and whether it needs any supplementary flue-warming or other modification. The technique as it stands is to connect four or five fireplaces to one flue, with the top storey always separate. On this basis heights of 10 or 11 storeys are now operating on shunt systems, and, of course, are much more economical than 10 or 11 flues.

* * *

Of course it is one of the mysteries of building in this country that one-storey constructions often turn out cheaper per unit volume than two- or three-storey work, and an even greater mystery that houses cost no more than about ¾ of the price of an equivalent flat, and sometimes less. It is in such contrast with continental experience, where flats are cheaper if anything than houses. But this may, of course, be because continental houses are too expensive. This needs, and is now to get, some study.

* * *

We will finish this discussion of construction with a short note looking forward to something which may come to underlie a great deal of design and construction—modular co-ordination.

Here we only know it in practice now as an influence upon prefabrication in schools and some of the housing work, with big unit dimensions such as 3ft, 3ft 4in, 4ft, 6ft 4in, and 8ft 3in, used both for components and grid planning. Other people in other countries know it only or mainly as a small unit of 4 or 5in size, generally influencing building by lacing together a critical set of building standards. Then, of course, it tends to sweep through building design and construction by inter-penetrating it with some semblance of dimensional co-ordination.



Jules Weitz Mono-Tower Crane

It is interesting to look at the European picture more closely, and especially the German sector of it for the Germans use it more extensively than others in practice. The position there is that a 12.5 cm module (about 5in) is the basic unit in standards for the shell and its components, associated for planning purposes with a 10 cm module. It is a condition of subsidy for housing work that these are used. Industry appears to be producing the components willingly, and although their use is more successful in some areas than others it is clear that it can work well and then it does seem to lead to economies.

In Sweden they are moving in much the same direction, but they are spending a long time preparing thoroughly before introducing the ideas into practice.

Some day it will come to us if for no other reason than to clarify the dimensional disarray of building standards. The human mind is like that. But if researches now being carried out show there are solid economic gains to be had through co-ordination, and how to maximize them, a sharper incentive will be given to the standardizing side of the matter and we will no doubt get on more quickly.

Some formidable questions have to be answered, however, for presumably we will have to have a small module for conventional building work, and this must be related to the large modules for prefabrication if we are to avoid perpetual muddle in our standards. Thus we will apparently have to have a basic unit with preferred multiples of it, and no doubt the arguments about the basic unit will be quite warm, for a great deal is at stake. Perhaps all that can safely be said at this moment is that the 4in module which is so widely talked of is by no means the only contender worth considering; there is at least one unit either side of it, and perhaps more that have arguments in their favour also. An open mind is now the vital need.

* * *

Part IV—THE BROADER PICTURE, will be published in a later issue with a report on the discussion.

CONTRACT • NEWS •

Notes below give basic data of contracts open under locality and authority which are in bold type. References indicate: (a) type of work, (b) address for application. Where no town is stated in the address it is the same as the locality given in the heading, (c) deposit, (d) last date for application, (e) last date and time for submission of tenders. Full details of contracts marked ★ are given in the advertisement section.

OPEN

BUILDING

ALDERSHOT B.C. (a) Flat over the garages at Laburnum Road Depot. (b) Borough Engineer, Town Hall. (c) 1gn. (e) June 11.

* * *

BARMOUTH (CAERNS.). (a) 2 houses, Barmouth, for Gwynedd Police Authority. (b) County Architect, County Offices, Dolgelley. (c) 2gns. (e) June 5.

* * *

BIRMINGHAM C.C. (a) Protective accommodation at 5 Police Divisional Headquarters. (b) City Engineer, Civic Centre, 1. (c) 2gns. each contract. (e) June 8.

* * *

BIRMINGHAM C.C. (a) Conversion of 328, Hagley Road, Edgbaston, into a home for aged persons. (b) City Architect, Civic Centre, 1. (c) 2gns. (d) May 24. (e) June 22.

* * *

BOURNEMOUTH B.C. (a) 24 houses, West Howe Estate. (b) Borough Architect, Town Hall. (c) 2gns. (e) June 15.

* * *

BRIGHTON B.C. (a) Erection of a milking parlour, covered yard, loose boxes and hay barn, Patcham Court Farm, Patcham. (b) Waterworks Engineer, 12, Bond Street. (c) 2gns. (e) June 1.

* * *

BRIGHTON B.C. (a) Factory, Hollingbury Light Industrial Area. (b) D. J. Howe, 26-30, Kings Road. (c) 3gns. (e) June 9.

* * *

CEMAES R.C. (a) 2 houses, with paths, fences, drains, etc., Tegryn Housing Site. (b) Messrs. Howard Williams and Partners, Priory Street, Cardigan. (c) 3gns. (e) May 28.

* * *

CHICHESTER C.C. (a) 7 shops and maisonettes, Parklands Estate. (b) Town Clerk, Greyfriars, North Street. (c) 2gns. (d) May 25. (e) July 8.

* * *

CLACTON U.C. (a) 6 pairs of houses at Alton Park and Anchor Road. (b) Engineer and Surveyor, Town Hall, Clacton-on-Sea. (c) 2gns. (e) June 1.

* * *

DARWEN B.C. (a) Brick-built mortuary, Robin Bank Road, including site preparation, etc. (b) Borough Surveyor, Municipal Buildings. (c) 2gns. (e) May 29.

* * *

EIRE—DUBLIN C.C. (a) Two 2-storey blocks of one-roomed flat dwellings, Donnybrook. (b) City Treasurer, Exchange Buildings, Lord Edward Street. (c) 5gns. (e) June 8.

* * *

ELLESMERE PORT U.C. (a) 1 block of 5 shops with living accommodation over on North Whitby Housing Estate, Part 1, Pooltown Road. (b) Engineer and Surveyor, Council Offices, Queen Street. (c) 3gns. (e) June 12.

* * *

FROME U.C. (a) Block of 10 garages, Queen's Road. (b) Council's Surveyor, 22, Christchurch Street, West Frome. (c) 1gn. (e) May 29.

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GLOSSOP B.C. (a) Erection of two combined male and female conveniences and nine urinals. (b) Borough Surveyor, Municipal Buildings. (e) June 2.

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HAMPSHIRE C.C. (a) 3 police houses, Fleet. (b) County Architect, The Castle, Winchester. (c) 1gn. (d) May 26.

• • •

ILFORD B.C. (a) Construction of a 2-storey Civil Defence control centre, Barkingside. (b) Borough Engineer, Town Hall. (c) 2gns. (e) June 2.

• • •

ILFORD B.C. (a) New public shelter and conveniences, Barkingside Cemetery, Ilford. (b) Borough Engineer, Town Hall. (c) 2gns. (e) June 2.

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LEOMINSTER B.C. (a) 6 houses, Westfield Walk Site. (b) W. B. Bond, Windsor House, 49-50, Calthorpe Road, Edgbaston, Birmingham, 15. (c) 2gns. (d) May 22.

• • •

LINCOLN C.C. (a) 8 flats and a suite of offices in 1 3-storey block, Redevelopment, Clasketgate/Flaxengate. (b) City Architect, Stamp End. (c) 2gns. (e) June 14.

• • •

LONDON—LEYTON B.C. (a) Erection of dwarf forecourt walls to 28 houses on various housing sites. (b) Borough Engineer, Town Hall, E.10. (c) 2gns. (e) June 2.

• • •

MABLETHORPE AND SUTTON U.C. (a) 16 maisonettes at junction of Waterloo Road and Sherwood Road, Mablethorpe. (b) R. W. W. Brown, 31, Osborne Street, Grimsby. (c) 2gns. (e) June 8.

• • •

MACCLESFIELD B.C. (a) 37 dwellings, Hurdsfield; 5 lock-up garages, Tennyson Close, Weston; 8 lock-up garages, Beeston Terrace, Weston; 6 lock-up garages, Wilton Crescent, Weston; 12 lock-up garages, Mason Lane, Hurdsfield; 6 lock-up garages, Leadbeaters Road, Brookfield Lane. (b) Borough Architect, 3, Jordangate. (c) 2gns. (e) June 4.

• • •

MANCHESTER C.C. (a) Alterations to form new floor at Princess Road Bus Garage, Moss Side. (b) City Architect, Town Hall. (c) 1gn. (e) June 1.

• • •

MELTHAM U.C. (a) 8 pairs and 2 blocks of 4 houses, Helme Lane Housing Estate. (b) Messrs. P. N. Brown and Son, Market Place, Honley. (c) 2gns. (d) May 24.

• • •

NEWARK R.C. (a) 4 houses, South Clifton. (b) Messrs. Wm. Saunders and Partners, 24, Castle Gate. (e) May 31.

• • •

NEWCASTLE UPON TYNE C.C. (a) District public convenience at junction of Welbeck Road and Fisher Street, Walker. (b) City Architect, 18, Cloth Market, 1. (e) May 27.

• • •

NORFOLK C.C. (a) Erection of a dining room, scullery and w.c. block, Hellesdon County Primary School. (b) Chief Education Officer, County Offices, Stracey Road, Norwich. (d) May 26.

• • •

NORTHUMBERLAND C.C. (a) Child welfare and maternity centre at Haltwhistle. (b) County Architect, County Hall, Newcastle upon Tyne. (c) 2gns. (d) May 24.

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NORTHUMBERLAND C.C. (a) Ambulance garage with flat above, Berwick-on-Tweed. (b) County Architect, County Hall, Newcastle upon Tyne. (c) 2gns. (d) May 24.

• • •

ORMSKIRK U.C. (a) 40 houses, Mill Dam Lane, Burscough. (b) Council's Surveyor, Council Offices, Burscough Street. (c) 2gns. (e) May 31.

• • •

ROCHDALE B.C. (a) 78 dwellings, Kirkholt Estate. (b) Borough Surveyor, Town Hall. (c) 2gns. (e) June 1.

• • •

ROWLEY REGIS B.C. (a) 98 houses, Corngreaves Estate. (b) Borough Architect Municipal Buildings, Old Hill, Staffs. (c) 5gns. (e) June 5.

• • •

SCOTLAND—FIFE C.C. (a) Following at Cameron Bridge Hospital, Windygates, for East Fife Hospitals Board of Management:—30-bed pavilion, T.B. treatment centre and alterations to existing ward, electrical installation and hot-water supply installation. (b) Messrs. Ross, Barker and Wallace, 27, Rutland Square, Edinburgh. (e) May 31.

• • •

SOUTHAMPTON B.C. (a) Wimpson County Primary Infants' School, Millbrook (360 places). (b) Borough Architect, Civic Centre. (c) £1. (e) June 16.

• • •

VENTNOR U.C. (a) 4 houses, West Street. (b) Engineer and Surveyor, Salisbury Gardens. (c) 2gns. (e) May 31.

• • •

WALES GAS BOARD. (a) Compressor house and switch-gear house at the new Aberavon Works. (b) General Manager and Secretary, Port Talbot Undertaking, Wales Gas Board, 18, Station Road, Port Talbot. (c) £4.

MISCELLANEOUS

LONDON—SOUTHGATE B.C. The Council invite building contractors to submit their names for inclusion in a selected list for carrying out building works within the following categories: (a) building contracts not exceeding £500 in value; (b) building contracts between £500 and £2,000 in value; (c) building contracts between £2,000 and £5,000 in value; (d) building contracts between £5,000 and £10,000 in value; (e) building contracts between £10,000 and £50,000 in value; (f) building contracts over £50,000 in value. Applications to Borough Engineer, Town Hall, Palmers Green, by June 1.

• • •

NORTHAMPTONSHIRE C.C. Contractors wishing to tender for erection of any of the following are asked to notify the County Architect, County Hall, Northampton, by May 25: Corby College of Further Education—3-storey steel-frames classroom block and extensive single-storey workshops; Corby Fire Station—single-storey building in traditional brick construction; Corby Police Station—3-storey steel-framed building; Roade 2-F.E. Modern School—3-storey and single-storey steel-framed construction; Rushden Alfred Street School—additional classroom in traditional brick construction; Wellingborough Grammar School—first-floor extension comprising one classroom, etc.; Wellingborough—3 pairs of police houses; Woodford-cum-Membris Modern School Extensions—3 classrooms, etc., in 2-storey steel-framed construction.

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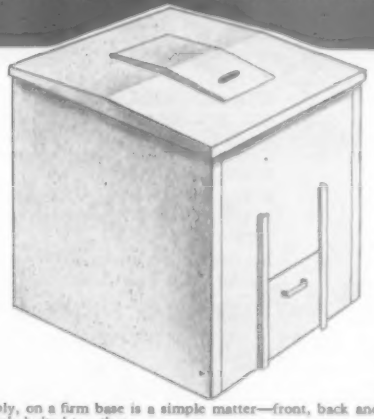
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BOROUGH OF OLDBURY.

APPOINTMENT OF ASSISTANT ARCHITECT.

APPLICATIONS are invited for the appointment of ASSISTANT ARCHITECT, Grade Va (£650 × 20—710), in the Architects' Section of the Borough Surveyor's Department.

Applicants for the appointment should be qualified members of the R.I.B.A. and preferably have had previous experience with a Local Authority. The appointment will be mainly in connection with Municipal housing and candidates should be experienced in the layout of contemporary housing schemes; design and construction of Municipal houses, flats and shopping centres and capable of administering building contracts.

The appointment will be superannuable, subject to the National Conditions of Service and to the selected candidate passing a medical examination.

Applications, giving particulars of age, qualifications and experience and the names of two referees, should be delivered to the undersigned not later than Saturday, May 29th, 1954.

Housing accommodation will be made available to married applicants if required.

KENNETH PEARCE,
Town Clerk.

Municipal Buildings,
OLDBURY.
May 6th, 1954. [7940

BERKSHIRE COUNTY COUNCIL.

BUILDINGS INSPECTOR GRADE VI
£695—£760.

A KEEN man having a thorough knowledge of building construction, materials and contract procedure is required in the County Architect's Department. To qualify for the above salary the successful applicant must possess A.I.R.C.S. Sub-Division 3 (building), otherwise the salary to be paid will be grade IV, £580—£625.

Application forms and further particulars can be obtained from the County Architect, Wilton House, Parkside Road, Reading, to whom they should be returned not later than Wednesday, the 2nd June, 1954.

E. R. DAVIES,
Clerk of the Council.
[7967

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HEAD OF SCHOOL OF ARCHITECTURE: D. W. NOTLEY, B.Arch.(Hons.), L'pool, A.R.I.B.A.

APPLICATIONS are invited for the post of full-time STUDIO MASTER in the School of Architecture which is recognized for exemption from the R.I.B.A. Final Examination. Duties to commence on the 1st September, 1954, or nearest date possible thereafter. Candidates should be fully qualified Architects, preferably holding the degree or diploma of a recognized school. Subject to the conditions governing full-time teaching service, the person appointed will be given such opportunities as may be practicable to maintain professional practice.

Salary: Burnham Scale for Grade B Assistants—at present £490 × £25—£765, Women £437 × £20—£512 plus allowances.

Application forms and further particulars from the Principal, College of Art and Crafts, Waverley Street, Nottingham, to whom the forms should be returned by 12th June, 1954.

F. STEPHENSON,
Director of Education.

Education Office,
Exchange Buildings,
Smithy Row,
NOTTINGHAM. [7956

APPOINTMENTS—contd.

BOROUGH OF STALYBRIDGE.

TO ARCHITECTS IN PRIVATE PRACTICE.

APPLICATIONS are invited from architects in private practice for appointment as ARCHITECT to the Housing Committee of the Council to undertake the preparation of plans, etc., quantities and other documents for the erection of houses and other buildings required by the Committee, the supervision of their erection, and the preparation of the necessary certificates and accounts. A whole-time Clerk of Works is employed by the Council.

The Architect will be paid the sum of £1,000 per annum by quarterly payments plus out of pocket expenses, and this sum will remain constant whatever number of buildings are erected in any one year.

A draft of the form of agreement which the Architect will be required to enter into can be obtained from the undersigned to whom applications for the appointment, giving details of the architectural work done by the applicant and the names of two referees, should be sent on or before the 1st June, 1954.

Applicants will be interviewed by the Housing Committee and they will be required to submit examples of their work.

P. W. MUSTHER,
Town Clerk.

18, Stamford Street,
STALYBRIDGE.
12th May, 1954. [7957

HOLLAND COUNTY COUNCIL.

APPOINTMENT OF DEPUTY COUNTY ARCHITECT.

APPLICATIONS are invited from Associates of the Royal Institute of British Architects with local government experience for the appointment of DEPUTY COUNTY ARCHITECT. Salary £1,250 × £50—£1,450. Conditions and particulars from Clerk of the County Council, County Hall, Boston, Lincs. Last date for applications 30th June, 1954. The County Architect will retire in January, 1956. [7966

BOROUGH OF SWINTON & PENDLEBURY.

ARCHITECTURAL ASSISTANTS.

APPLICATIONS are invited for the following positions:—

(i) Grade A.P.T. VI-VII commencing salary £695 rising to £810 per annum. Applicants must hold the final qualification of R.I.B.A. and be registered architects with good experience in Municipal housing.

(ii) Grade A.P.T. IV-V commencing £580 rising to £670. Applicants must have passed the intermediate examination of the R.I.B.A. or hold an equivalent qualification.

Details of appointment from Borough Surveyor, Town Hall, Swinton, Lancs. Closing date for return of form of application 9th June, 1954. Canvassing disqualifies.

VINCENT COLLINGE,
Town Clerk.
[7960

NORTHERN POLYTECHNIC, HOLLOWAY, LONDON, N.7.

THE Governing Body invite immediate applications for appointment as full-time LECTURER on Theory of Structures, Advanced Construction and Building Regulations. The successful candidate will be required to take up duties in September next and to teach the above subjects to full-time and evening students in the Day and Evening Schools of Architecture, Surveying and Building. Professional experience in these fields and some teaching experience are essential. Salary scale—£940 × £25 × £1,040 plus London Allowance. Form of application, together with full particulars, will be forwarded on receipt of a stamped, addressed foolscap envelope.

R. H. CURRELL, A.S.A.A.,
Clerk.
[7955

APPOINTMENTS—contd.

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APPLICATIONS are invited for the post of SENIOR LECTURER IN TOWN PLANNING.

The basic salary attaching to the position is £1,000 per annum rising by annual increments of £50 to £1,200. This is supplemented by a generally authorised cost of living allowance of £92 8s per annum.

An allowance is made towards the cost of travelling expenses.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 5, Gordon Square, London, W.C.1.

The closing date for the receipt of applications, in New Zealand and London, is 31st July, 1954. [7964

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Application form from The Secretary (Inspectors' Section), Ministry of Education, Curzon Street, London, W.1. Closing date 15th June. [7961

LONDON COUNTY COUNCIL.

ARCHITECT'S DEPARTMENT.

VACANCIES for ARCHITECTS in Schools and Housing Divisions. Salary to £721.

Particulars and application forms from Architect (AR/EK/A/3), County Hall, S.E.1. (374.) [0141

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SENIOR Architectural Assistant required, capable of developing from sketch plan to completion. General practice including factory, hotel, shop, office and domestic work. Knowledge of quantities essential. Please write, stating experience, salary, etc., required, to W. Richardson White, 23 & 33, Albert Street, Mansfield, Notts. [7965

ARCHITECTURAL APPOINTMENTS VACANT—contd.

ARCHITECTURAL assistant, preferably with experience industrial building; salary by arrangement depending on qualifications and experience.—Apply Booth and Ledeboer, 9, Blackhall Rd., Oxford (Tel. 57217). [7954

ARCHITECT'S senior and junior assistants required.—Write, stating experience and salary required, to Floyd, Robson and Paul, Chartered Architects, St. Nicolas House, West Mills, Newbury, Berks. [7951

ARCHITECTURAL assistants, qualified and intermediate standard, required at once in Midland offices; a flair for contemporary design necessary, and T.P. qualifications or experience would be an asset; salary up to £550 p.a.—Reply Box 5443. [7952

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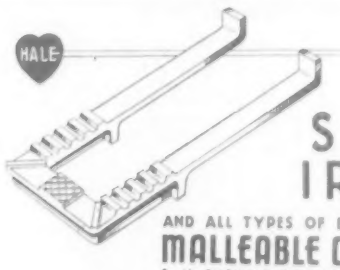
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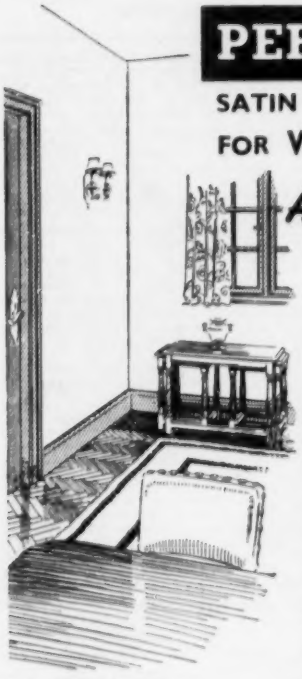
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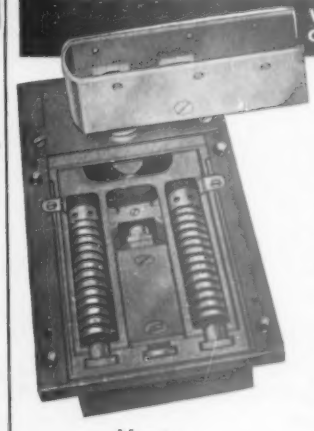
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